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THE PRACTICAL TREATMENT OF WORKING CAPITAL.

In proceedings before public-utility commissions, the treatment of working capital is often of much importance. In rate cases it frequently is necessary to explain to the regulating board how the working capital allowance of the operating company is derived, in order that the commission may pass intelligently upon the return to be permitted upon this component of the total investment in the property. Specific discussions of this topic are helpful, and one of the most fruitful which has lately come to hand is that of the New England Telephone & Telegraph Company before the Vermont Public Service Commission in connection with a pending rate case.

In the case of the New England Company the amount of working capital which should be apportioned to its Vermont business had to be a matter of estimate. The auditor estimated the working capital in Vermont in proportion to the value of the plant of the company in that state as compared to the total plant value.

Additional light was thrown upon this question by Mr. William J. Hagenah, a well known expert testifying on behalf of the company. Mr. Hagenah stated that in order to determine the proper amount of working capital in such a plant, he would make an examination of the company's balance sheets over a series of years to determine the amount invested in materials and supplies, which he considers a liquid asset, the amount of cash ordinarily carried and required in the business, the amount of the accounts and bills receivable, and the accounts and bills payable. Ordinarily the net working capital is the excess of the current assets over the current liabilities, although that again would be a subject of further study as to local conditions. The witness stated that the allowance for working capital in public-utility cases, including material and supplies, can be arrived at roughly as 25 per cent of the gross earnings in one year, or, say, five per cent of the appraised replacement value of the property. It is suggestive that the Nebraska State Railway Commission has in a recent case allowed six per cent of the reproductive value for supplies and working capital.

The thoroughness with which the Vermont company was able to explain its figures is worth emulating in other branches of public-utility service. These matters are obviously closely allied to the more technical duties of the accountant, but are

problems with which a public-utility manager has to deal. They are important, and it is worth bearing in mind that it is just as essential in a rate case to present to a commission a correct total of the investment upon which returns are to be earned as it is to hunt down elusive heat units in the steam piping and boiler gas passages in the attempt to save money in fuel outlays.

MAXIMUM DEMAND AND THE COOKING LOAD.

At the last meeting of the Point Fives, a club of English central-station managers whose meter charge is 0.5 penny or one cent per kilowatt-hour, an interesting discussion took place regarding the basis upon which the additional or demand charge should be scheduled. The paper of the evening by Mr. A. H. Seabrook was an advocacy of a system unknown in this country but prevailing to a wide extent in England. In this system the fixed payment is proportioned to the assessed valuation of the residence which is supplied and it is advocated mainly on account of its simplicity and the fact that no instrument is required, as in the case when the maximum demand is actually measured. The system is easily understood by all and is regarded as involving an element of reasonableness in that the amount of lighting load will bear some rough relation to the value of the property lighted. This system is not applied to offices, stores, factories or other business properties.

While such a system is of interest there are several reasons why it is not likely to be ever introduced in this country. Its attainment of the desired end does not compare in accuracy with a measurement of the demand, nor even with an ascertainment by inspection of the connected load. The measurement of cubical contents or of floor area to be lighted would seem much more equitable, and assessed value has the single advantage that the premises need not be visited in order to determine the charge. In this country assessed valuations are too erratic and unequal to form a basis for any kind of charge except taxes, as it is in only a comparatively few cities, such as Cleveland, O., and Houston, Tex., that values have been assessed on any systematic basis which insures a reasonably definite relation to the actual value. Moreover, our whole tendency is towards systems of rates based upon the cost of service and such a rough approximation to actual demand costs has little to recommend it.

One of the most interesting points that came up in the discussion of this paper was in connection with the effect upon maximum demand of adding a cooking load to an already existent lighting load. It must be remembered that the members of this club are all interested in the development of cooking and other heating loads. One of the members raised the point that in encouraging a heavy cooking load the maximum demand might be largely increased, owing to the overlapping of the two peaks. Mr. Seabrook replied that this fear arose from lack of experience with cooking load and instanced a plant having a 60-kilowatt lighting load, to whose lines a cooking load of about 75 kilowatts was connected. The combined maximum demand was not large enough to require any increase in the capacity of the plant, indicating a large diversity of load.

Another point brought out was that under a system of rates where the energy charge is so small it was becoming common to have an all-night heating load in residences during periods of cold weather.

DISTINCTIVE ADVERTISING BY CENTRAL STATIONS.

As central-station managers realize the possibilities of advertising along originaal lines which pertain especially to the field of applied electricity, the industry is bound to witness a great expansion in this kind of activity. The opportunities are literally innumerable, and in many cases may be turned to account at a nominal cost. In a representative case a central station which used to have a reputation for extreme conservatism took up the question of distinctive advertising within its own organization, and the results have many times repaid the time and trouble involved in preparing displays. The company's campaigns to arouse popular interest have been conducted along the usual newspaper lines, but in addition, the show-window spaces at the main office have been featured with more than ordinary ability, and the kind of displays exhibited from time to time deserve comment.

One of the most effective demonstrations was the installation of a one-thirty-second-horsepower motor and a 36-inch pulley, the two being connected by a single piece of looped twine. The pulley was of the ball-bearing type and was easily started by throwing the motor switch. A small groove cut in the face kept the cord in place and suitable placards set beside the apparatus emphasized the efficiency of the electric drive. Now to an engineer, this display was ridiculously simple, appealing to kindergarten standards of technical intelligence; but it caught the passing crowd's attention, drove home a lesson regarding the cleanliness, compactness and effectiveness of the individual motor, and cost next to nothing to operate continuously—probably not greater than a half cent a day.

Another exhibit which appealed to the public was a transparency showing how the principal street of the city would look when illuminated by a proposed "White Way" lighting installation. In this case the actual view happened to be taken in another town, but the street section selected closely resembled the thoroughfare in front of the company's office and gave an excellent idea to the public of the quality of illumination resulting from the close spacing of magnetite lamps on the sidewalks. Here again, the cost

of operation was small, three or four 25-watt tungsten lamps sufficing, when placed behind the transparency in a light-proof box with a few holes in the sides to provide for ventilation. The company also showed a single ornamental luminous arc lamp in its windows in the form of a drawing on transparent paper set into a box in which were a couple of 25-watt lamps which threw the accepted standard into prominence on the screen and beautifully demonstrated the type of individual street-lighting unit later adopted by the city fathers.

A more elaborate but comparatively inexpensive display consisted of a model central-station system, showing the various steps in energy transformation between the coal pile and the consumer's lamp. The actual transformations were not attempted, but by connecting toy boilers, engines, generators and motors in appropriate sequence, including a miniature pole line with tiny street lamps run off the office circuit, an excellent exhibit resulted. The small motors were arranged to drive toy woodworking machinery and the attention that the display received surpassed all expectations. Another central station in the same territory carried out this scheme a little further by building a model motor-driven machine shop some 4 feet long and 30 inches high, in which the flexibility of the group drive could be demonstrated with striking effect. This exhibit has been much in demand at "Merchants' Weeks," fairs, home-coming weeks, Chamber of Commerce displays and other occasions of local importance.

With the co-operation of manufacturers of motor-driven machine specialties it ought to be easy to get up a new display every fortnight based on the application of the motor drive to some particular industry. Experience indicates that a single machine properly placarded and equipped for actual movement before the public eyes may be fully as effective as a complex and multiplied form of demonstration.

In like manner, there is a broad field for the display of lighting specialties in distinctive central-station publicity. The local art museum may be considering the adoption of special reflecting apparatus, or a shop in which the community takes pride may have improved the lighting of some department. The display of representative photographs or sample equipment units associated with these newsy changes represents the acme of effective publicity. On every central-station system except the smallest there are today in operation numerous devices which are more than adaptable to window featuring, and at a cost far below their usefulness to the company having the foresight to turn these things to account. In brief, the distinctive advertising of the modern central station should be an indication of its progress so far as the newspaper displays go, and a moving picture of its development and increasing usefulness to the community in the office-window branch of its publicity campaign.

TRANSFORMER RATIO AND REGULATION.

The fact that the ratio of a potential transformer is somewhat affected by the magnitude of the exciting current as well as by the load current is probably responsible for the circumstance that a formula for regulation which involved the exciting current was in extensive use a few years ago. In an article published in this journal in the issue of August 7, 1909, it was conclusively shown that exciting current has no appreciable effect upon the value of the regulation. This work has been followed up at the Bureau of Standards and another contribution is published in this issue by Messrs. Agnew and Silsbee, which should leave no doubt in anyone's mind that the formulas given correctly represent the values of the regulation as well as those of the ratio and phase angle.

These formulas give the above quantities in terms of the readings which can be obtained by a short-circuit test and upon open circuit These are the readings usually taken in a transformer test and represent a method much more convenient than that of actually loading the transformer. It is the customary commercial method. The object of this paper is to show that the results obtained from computation based upon such readings are justified. The experimental results given by the authors demonstrate this for the particular transformers which were tested, but it might perhaps be of value to carry out similar measurements upon widely different types and sizes of transformers in order to show whether any limitations must be put upon the formulas in practical use. The laboratories of manufacturers having the necessary facilities might well investigate this point.

In this connection it should be remembered that the regulation of a potential transformer is the ratio of the rise of secondary terminal voltage from rated non-inductive load to no load (at constant primary impressed terminal voltage) to the secondary terminal voltage at rated load. A transformer is rated in terms of its output, so that full load represents the delivery from the secondary of rated wattage or current at rated secondary voltage. When the voltage rating is stated in terms of the primary there may be some question as to the exact value which should be taken for the secondary voltage, but when the secondary voltage is stated this doubt should not arise. On account of the voltage drop in the windings of the transformer, a slightly different voltage must be applied to the primary to give secondary rated voltage at no load and at full load. According to the Standardization Rules of the American Institute of Electrical Engineers, rated load is determined as above stated and regulation should be based upon whatever primary voltage is necessary to give the rated conditions at the secondary terminals. The change in secondary voltage when the primary impressed voltage is kept constant determines the regulation.

Jovian Meeting in Chicago.

M. R. Lash, with M. B. Austin & Company, Chicago, was the speaker at the meeting of the Jovian League of Chicago, on February 16. Mr. Lash first called upon Jovians who travel to practice co-operation by commenting on street lighting, or the lack of it, when visiting a city and thus show the citizens that the present system, if modern, is attracting attention, or if lacking, that this fact is noticeable to the stranger.

Speaking of street-lighting installations, Mr. Lash called attention to the various underground transmission systems used, comparing these with steel-tape cable which, he claimed, is much less expensive—both in first cost and maintenance—is easy and inexpensive to install and is suitable for any type of installation. To install this cable it is simply necessary to dig a suitable trench and lay the cable, no extra protection being necessary. It is not affected by moisture and in no case has trouble from electrolysis been encountered.

Following the address of Mr. Lash, Chairman Niesz presented a set of resolutions which provided for the discontinuance of the weekly meetings and consolidating with the Chicago Electric Club, providing the latter accepted the resolutions. The Jovians voted unanimously in favor of the merger and the matter will now be taken up by the Electric Club.

Pittsburgh Section Banquet.

The annual banquet of the Pittsburgh Section of the American Institute of Electrical Engineers was held at the Fort Pitt Hotel, Pittsburgh, Pa., on Saturday evening, February 14, over 300 members and guests being present.

C. O. Mailloux, president of the Institute, was guest of honor. A. M. Dudley, chairman of the local section, made a brief welcoming address and introduced the toastmaster, S. M. Kintner. The first speaker, Mr. Mailloux, responding to a toast "The Institute," spoke of the Institute as performing a great service to humanity by educating the general public along electrical lines, and by breaking up the cliques which formerly existed among electrical workers.

P. M. Lincoln, discussing "Rates," pointed out the unreasonableness of the popular demand for house service at the same rates that are given to factories. L. M. Davidson, superintendent of Pittsburgh schools, responding to "The Making of an Engineer," pleaded for co-operation between the American Institute and kindred organizations, and the public schools in the training of good citizens. George P. Early, of the American Sheet and Tin Plate Company, responded to "Stomatology."

New York Electrical Society.

On the invitation of the United Electric Light and Power Company the New York Electrical Society will hold its 326th meeting at the new 201st Street generating station of the Company, on Friday, February 27, at 8 p. m.

Frank W. Smith, vice-president of the Company, will give a brief review of the history of the Company and the development of alternating-current supply in this city.

H. W. Leech, electrical superintendent, will give an illustration description of the station.

Following the meeting the station will be inspected, the company providing special guides for that purpose.

The premises may be easily reached from the Dyckman Street Station of the Broadway subway.

Change of Date of I. E. C. Dinner-Dance.

Announcement is made of the interchange of the dates of the International Electrical Congress publicity meeting and the Congress dinner-dance to be held during the midwinter convention of the American Institute of Electrical Engineers at New York City next week. According to the revised program the publicity meeting will be held in the auditorium of the Engineering Societies Building on Wednesday evening, February 25. On Thursday evening, February 26, the I. E. C. dinner-dance will be held at the Hotel Biltmore.

Oklahoma Telephone Meeting.

At the annual meeting of the Oklahoma Telephone Association held last week at Oklahoma City, Horace Trumen, of Geary, was elected president; L. T. Hine of Purcell, vice-president; and Frank McGuire of Broken Arrow, secretary and treasurer. Addresses were made by L. T. Hine on "Government Ownership;" by W. J. Steele on "Why Two Associations?" and by G. W. Hardwick on "Construction."

Westinghouse Dinner.

The Westinghouse Progress Club had a dinner at McCreery's, Pittsburgh, on February 14.

Congressman M. Clyde Kelly spoke on "Ideals of Progress." Other speakers were President E. M. Herr and J. J. Jackson, of the Westinghouse Electric & Manufacturing Company. The toastmaster was R. L. Wilson, superintendent of the Railways Department.

Minnesota State Association Meeting.

The annual convention of the Minnesota Electrical Association will be held at Minneapolis on March 18, 19 and 20.

Empire Association Meeting.

A joint meeting of the Empire State Gas & Electric Association and the Eastern New York Section of the National Electric Light Association was held at Schenectady, N. Y., on February 6 and 7.

At the session on Friday morning William McClellan presented a discussion of various matters affecting public opinion with respect to gas and electric companies. He referred to (1) the necessity of maintaining intimate relations with the public, by having all officers easily accessible and the offices of the company surrounded by an atmosphere of welcome; (2) the necessity of giving all employees of the company as much authority as is safe to make adjustments and handle complaints and other business with consumers; (3) the necessity of considering all employees as company outposts in the community, recognizing that they are easily accessible to many citizens whom they meet in business, in recreation and at home; (4) the responsibility of the company to be a good citizen in public welfare work and the desirability of contributions to public institutions, etc.; (5) the subtle but powerful influence resulting from cordial and frank action of the company in connection with all legislation directly affecting it or indirectly affecting it through the community; (6) advertising might also be added in connection with the discussion on public opinion but this is such a large and special subject it should only be referred to in such a meeting as this; (7) the necessity of prompt and adequate settlement of complaints; (8) the effect of a thoroughly systematic set of rate schedules capable of explanation to the consumer and giving the least opportunity for the charge of discrimination.

Lunch was served at the Mohawk Golf Club. At the afternoon session C. W. Stone spoke on "Commercial Aspects of New Lamp Development with a Retrospect as to the Effect of the Mazda Lamp on Central-Station Revenues." C. H. B. Chapin made a report on the calorimeter situation. Dinner was also held at the Mohawk Club.

On Saturday morning visits were made to the works of the American Locomotive Company, the General Electric Company and the Mohawk Gas Company.

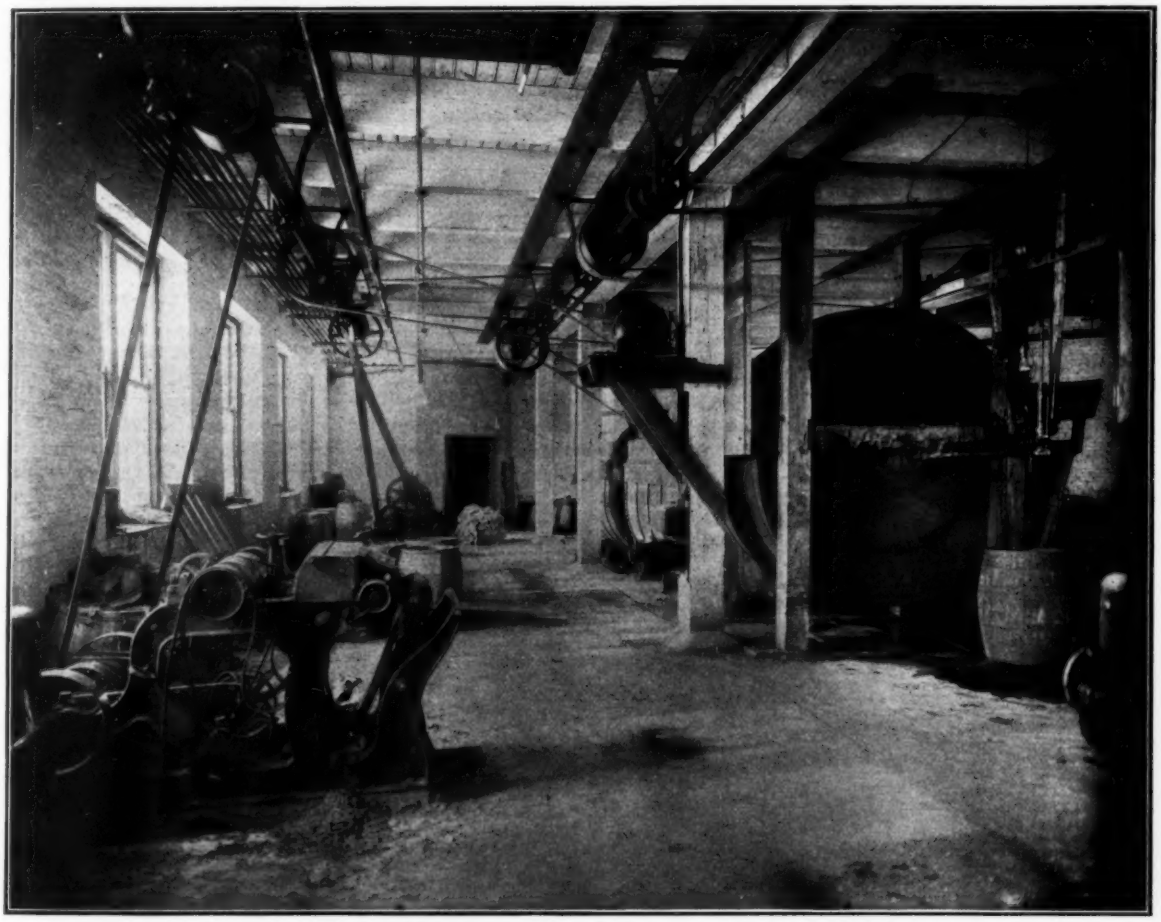
Ohio State Convention.

The annual convention of the Ohio Electric Light Association will be held at Cedar Point, O., on July 21, 22, 23 and 24. There will be no exhibits at the convention this year and the afternoon entertainment will be superseded by sessions of the convention. The usual evening entertainments will be repeated.

Electricity in Glove Manufacturing.

Cleanliness and reliability are two of the most important requirements of power transmission in glove factories. Electric motor drive with central-station power successfully meet these requirements and in addition make possible a greater production with the present labor and equipment, due to the better speed characteristics of motor-driven machines. Data are given in this article concerning several typical plants purchasing power.

The two most important requirements of power transmission in glove factories are cleanliness and reliability. The importance of cleanliness is readily appreciated by those manufacturers who have changed from the mechanical to electric drive and have been in a position to observe the savings. In plants employing steam-engine drive considerable dirt and grease are thrown about by the belts and pulleys and the amount of goods damaged in this way is by no means a negligible item chargeable to mechanical drive. This is true even when liberal use is made of drip pans under hangers.



Group of Staking Machines and Scourers in Tanning Department of Glove Factory.

In regard to reliability it is evident that since the payroll is one of the largest items in the cost of glove manufacturing the chance of accident should be reduced to a minimum. With a private plant the production of power while an important matter, is a side issue and as such cannot receive as much attention as if it were the sole reason for being in business. The reliability of the power supply is thereby impaired.

The failure of any part in the power plant may cause a complete shut-down for a more or less extended period. The reliability of the supply is largely dependent upon the efficiency and foresight of the engineer.

A shut-down in an isolated plant is liable to be prolonged by inferior facilities available to the operators, their own small number and lesser ability to cope with emergencies. Shut-downs are expensive in glove factories, for even though a part of the payroll may stop with the machinery, as when the girls are on piece work, still the production has been curtailed by an amount proportional to the duration of the shut-down. The investment charges go on whether the machines are running or not.

On the other hand, the production and marketing of power is the sole reason for the existence of the central station, consequently every effort is made by the management to improve the service in every possible detail. There is, however, no possible chance for a complete shut-down due to an accident to any machine as there is always a spare unit available.

Another of the important advantages of electric motor drive in glove factories, when central-station power is used, is the increased production with

the present equipment and labor. This is due principally to the uniform speed of motor-driven machines, whether driven by individual motors or in small groups.

A reciprocating steam engine seems to give a steady speed when a speed indicator of the usual type is applied to its shaft. The rapid variations in angular velocity due to the change from linear to rotating motion, while too rapid to be seen, are usually great enough to cause wastage and to unduly shorten the useful life of shoe machinery.

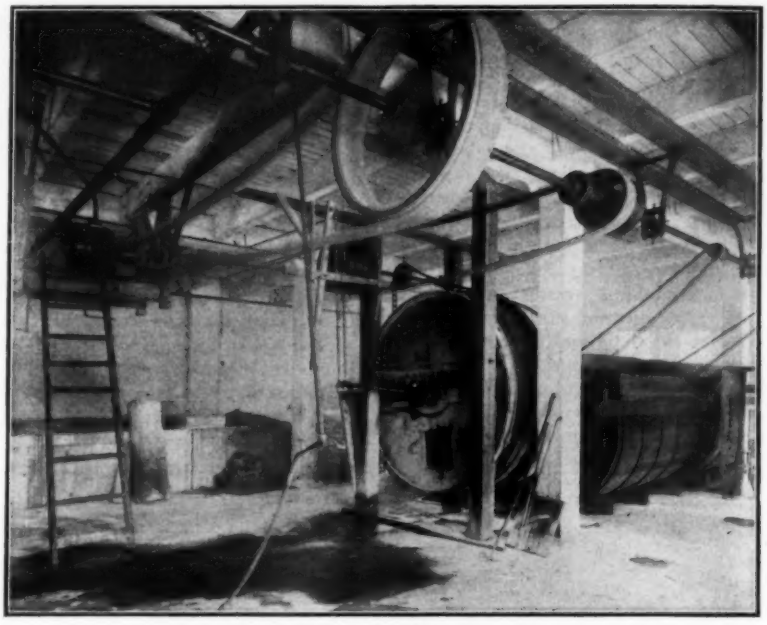
A long shaft driven by reciprocating engines often shows 10 per cent speed variation at the end farthest from the prime mover. This variation is caused by the initial unsteadiness of the prime mover, accentuated by the slipping and crowning of belts partly due to glazed spots and by the jerks of the machines themselves.

The steadiness of electric drive with their constant angular velocity, increases the useful life of the driven machinery and greatly reduces wastage.

The slipping of belts between engine and driven machine frequently results in 10 to 20 per cent loss of speed to the latter. With group electric drive the number of belts and shafts is greatly reduced, while with individual-motor drive they are entirely eliminated and each machine is kept up to its maximum productive speed at all times.

Also, a careful study of the manufacturing process often suggests a much better arrangement of the machinery. The proper machine layout, only possible with electric drive, means a minimum handling of material with the maximum facility for rapid work. It is often found that certain machines retard the entire factory output. Obsolete or worn-out machines should be discarded and replaced by modern machines of ample capacity. The addition of a machine or employee in a process which is limiting the factory output will generally increase the output. The substitution of modern machinery to perform these processes carried on by hand not only lowers the cost of production, but also increases the output.

Glove manufacturing inherently requires small amounts of power spread over a comparatively large floor area. On account of the better light, those processes requiring power are usually located on the upper floors. If mechanical drive is used it must of necessity be complicated and uneconomical.



Motor Driving Washing Drums.

Group of Motor-Driven Sewing Machines.

Factory Layout.

Maximum output at minimum cost is the goal toward which the manufacturer is ever working. The best possible routing of material and of the partly finished garment, combined with making the best possible use of the available daylight, are very important factors in increasing efficiency. If the building is long and narrow, the sewing-machine tables should be located parallel and as near to the building walls as possible. The sewing tables, where work of an exacting nature is done, should also be similarly located. The less exacting work should be located in the middle of the building. If the building is broad and well lighted by daylight, it is often advantageous to place the sewing-machine tables, as well as those tables on which the best light is required, at right angles or at the most desirable angle to the building walls. This angle will depend somewhat on the size and spacing of the windows and should be determined by experiment. The length of these tables will usually be limited by the amount of daylight obtainable on the inside ends of the tables. White oil-painted walls and ceilings increase the amount of effective light. Those processes which do not require so much light should be carried on in the center of the floor.

The tables in the cutting rooms are generally placed at right angles to the building walls. As the cutters stand at their work and work from both

Glove Manufacturing Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

The Ross-Sellinger Company, Sheboygan, Wis. This company manufactures a complete line of leather gloves of all varieties. The average daily output is 400 dozen pairs. There are 100 men and 200 girls employed, working 9 hours per day.

Total connected horsepower, 40. Total number of motors installed, 11. Average kilowatt-hours per month, 2,379. Average kilowatt-hours per month per horsepower connected, 59.4.

Kilowatt-hour consumption for 12 months.

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	2,000	May	1,920	September	2,540
February	2,760	June	2,510	October	2,570
March	1,620	July	2,050	November	2,880
April	2,650	August	2,420	December	2,630

Load-factor, 19 per cent; operating-time load-factor, 25.4 per cent.

The approximate electrical energy consumption per 100 dozen gloves manufactured is 22.8 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	10	1,800	Belted to line shaft driving 108 sewing machines (Singer and Wheeler & Wilson).
1	5	1,800	Belted to line shaft driving 44 sewing machines.
1	5	1,200	Belted direct to mechanism of freight elevator.
1	3	1,800	Belted to short line shaft driving machine-shop equipment.
1	5	1,800	Belted to line shaft driving 60 sewing machines.
1	3	1,800	Belted direct to special emery wheel for smoothing hides.
1	3	1,800	Belted direct to a Seelye Manufacturing Company 46-inch cloth press.
1	1	1,800	Belted to direct-current generator for supplying energy to a hand cutting machine.
1	2	1,800	Belted direct to a Seelye Manufacturing Company 66-inch cloth press.
1	2	1,800	Belted direct to a Seelye Manufacturing Company 48-inch cloth press.
1	1	1,800	Belted direct to a buffing machine for polishing and finishing gloves.

Glove manufacturing plant located in Wisconsin. Plant operates 48 hours per week. The output varies, the product being leather and canvas driving and work gloves principally.

Total connected horsepower, 5. Total number of motors installed, 2. Average kilowatt-hours per month, 482. Average kilowatt-hours per month per connected horsepower, 96.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	668	May	700	September	198
February	717	June	642	October	13
March	624	July	590	November	50
April	720	August	796	December	67

Load-factor, 17.6 per cent; operating-time load-factor, 46.3 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is single-phase, 60 cycles, 220 volts.

No.	Horse-power	Speed R. P. M.	Application.
1	3	1,800	Belted to 10-foot line shaft driving one four-blade staker, one Vaughn leather measuring machine; one cutting press, for cutting glove linings; and 14 sewing machines.
1	2	1,800	Belted to line shafting driving 36 machines of Wheeler & Wilson make such as sewing machines, binders and silkers.

Small glove factory, located in Chicago making cloth and canvas work gloves and mittens. Plant operates 60 hours per week.

Total connected horsepower, 7.5. One motor is installed. Average kilowatt-hours per month, 354. Average kilowatt-hours per month per connected horsepower, 48.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	297	May	489	September	304
February	390	June	431	October	218
March	397	July	360	November	301
April	400	August	388	December	281

Load-factor, 8.6 per cent; operating-time load-factor, 18.2 per cent.

MOTOR INSTALLATION.

The following is a record of the motor installation. The supply source is three-phase, 60 cycles, 220 volts:

No.	Horse-power	Speed R. P. M.	Application.
1	7.5	1,200	Belted to line shafting driving one 46-inch cloth press; one 66-inch cloth press; and 48 Wheeler & Wilson and Singer machines of various descriptions.

Glove-Manufacturing Data—Sheet No. 2.

Richard Evans & Sons, Gloverville, N. Y. This plant manufactures gloves on a large scale making principally heavy buckskin working gloves, automobile gauntlets and various other styles in cheaper quality sheepskin leather. The average daily output is 300 dozen pairs of gloves. There are 350 men and girls employed working 10 hours per day. About 500 persons work at home for the company.

Total connected horsepower, 19.5. Total number of motors installed, 7. Average kilowatt-hours per month, 1,682. Average kilowatt-hours per month perhorsepower connected, 86.5.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	1,751	May	1,752	September	1,721
February	1,933	June	1,739	October	1,621
March	1,583	July	1,659	November	1,653
April	1,710	August	1,576	December	1,534

Load-factor, 15.8 per cent; operating-time load-factor, 33 per cent.

The approximate electrical energy consumption per 1,000 pair of gloves manufactured is 19 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is two-phase, 60 cycles, 110 volts. Energy is supplied by the Fulton County Gas & Electric Company. The motors are all of the Westinghouse squirrel-cage induction type.

No.	Horse-power	Speed R. P. M.	Application.
1	3	1,800	Belted to 39-foot line shaft, nine hangers, driving 20 machines such as wax-thread machines, stitchers, seamers, etc., of Singer, Curtin & Herbert and Union make.
1	3	1,700	Belted to a 40-foot line shaft, 10 hangers, and two countershafts, two hangers, driving 19 machines of Wheeler & Wilson make such as needle machines, binders and needle silkers; one eight-inch engine lathe; and one six-inch double emery wheel.
1	3	1,700	Belted to a six-foot shaft, three hangers, and then to two 50-foot shafts and a two-hanger countershaft driving 81 machines such as over-stitchers, needle silkers, binders, etc., of Wheeler & Wilson, French, and Polamateer make; one plush-wheel stand (three bearings) two wheels, 12 by 8 inches; and one United Shoe Machinery Company clicking machine, flywheel 16 inches in diameter.
1	5	1,120	Belted to a five-foot shaft, three hangers and one countershaft, two hangers, driving one Vaughn Machine Company leather splitter, two-inch blade.
1	0.5	1,720	Belted to a two-hanger shaft driving one Vaughn Machine Company leather measuring machine, driven pulley 16 inches by 2.5 inches.
1	2	1,700	Belted to a 15-foot three-hanger shaft driving two Shepard stakers, 56-inch wheel carrying four blades, 18 and 22 revolutions per minute, respectively; and one United Shoe Machinery Company clicking machine.
1	3	1,720	Belted to a two-hanger shaft driving an H. J. Anthony cutting press for cutting cotton lining for gloves.

Meyers and Company, Gloversville, N. Y. This company manufactures a high grade of kid gloves, having an average output of 400 dozen pairs per day. There are 500 employees working 10 hours per day.

Total connected horsepower, 38. Total number of motors installed, 8. Average kilowatt-hours per month, 2,440. Average kilowatt-hours per month per horsepower connected, 64.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	1,370	May	2,950	September	2,570
February	3,070	June	2,160	October	2,310
March	2,690	July	2,270	November	2,630
April	2,770	August	2,330	December	2,230

Load-factor, 11.8 per cent; operating-time load-factor, 24.6 per cent.

The approximate electrical energy consumption per 1,000 pairs of gloves manufactured is 18.2 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is two-phase 60-cycles, 220 volts. Motors are of Westinghouse squirrel-cage induction type Energy is supplied by the Fulton County Gas & Electric Company.

No.	Horse-power	Speed R. P. M.	Application.
2	0.5	1,700	Each belted direct to one Anthony die press.
1	20	1,200	Belted to a 40-foot shaft, seven hangers, driving four buffing wheels; one finishing machine; and one Buffalo No. 5 blower.
4	3	900	Belted to line shafting driving 38 Wheeler & Wilson silkers, over-stitchers, hemmers, etc.; 48 Singer seamers, stitchers, etc.; 28 Singer and Wheeler & Wilson two, three and four-needle stitchers: and 28 Singer making-up and finishing machines.
1	5	1,200	Geared to mechanism of a one-ton freight elevator.

Three-Horsepower Motor Driving Sewing Machines.

sides of the table, it would be poor practice to place these tables parallel to the windows where those working with their backs to the windows would be standing in their own light.

Selection of Motors.

Nearly every type of machine found in a glove factory runs at constant speed. For this reason either alternating or direct-current motors can be used to advantage, although it is evident that as most of the motors in the factory are not larger than five-horsepower, the extreme simplicity of control of the induction motor is a strong point in its favor. Induction motors of less than 7.5 horsepower are started by simply closing a switch.

Sewing machines are the principal machines used in glove manufacturing. In general, where there are a number of sewing machines on somewhat similar work, group drive is preferable. Tests show that a group drive of ten sewing machines in the average factory takes one horsepower. If individually driven, each machine should be equipped with a one-sixth-horsepower motor. While the load-factor on a single sewing machine is low, the load-factor on a group-drive motor is high. This is due both to the approximately regular periods at which each machine is working and to the fly-wheel effect of the rotating parts. Group drives of from ten to thirty machines are most desirable, twenty being the average. Slow-speed motors, either alternating-current or direct-current, should be used and should be direct-connected to the shafting driving the machines. These motors should run at approximately 500 revolutions per minute. This arrangement is by far the simplest and most satisfactory.

When changing over a factory from line-shaft drive to motor drive, in case conditions demand it, motors of higher speeds can be placed under the tables and connected with short belts to the sewing-machine table shafting. Motors and belts should be properly boxed in as a guard against accident.

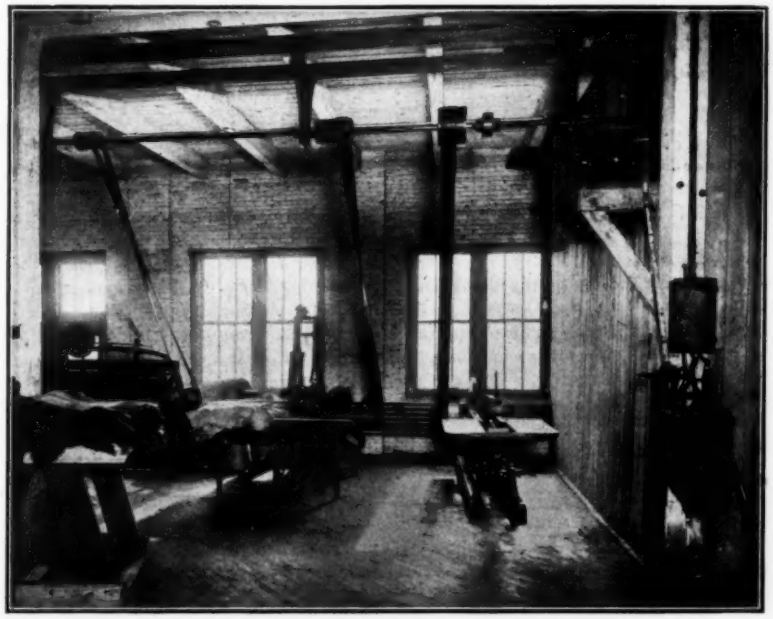
Clicking machines or dies used for cutting leather require only about 0.1 horsepower. Power presses for cutting cloth require from 0.5 to 3 horsepower depending upon the size. Direct-connected portable cutting machines are used for cutting a large number of thicknesses of cloth at one time. Some of them will cut a layer of cloth three inches thick. Their horsepower varies from one-thirtieth to one-sixth.

Lighting.

The arrangement of the machines and tables should be such as to take advantage of the daylight to the greatest extent consistent with the best routing of materials and partly finished goods. Light-colored floors and ceilings painted with white oil paint increase both the natural and artificial illumination to a surprising extent.

On account of its color value, high efficiency, and its adaptability to various conditions, the tungsten lamp has come into very general use in glove factories. With the exception of the individual lights on the sewing machines and a few of the sewing tables, the tungsten lamp has been very generally substituted for the carbon. Where individual lighting is necessary, general illumination of low intensity, with the units close to the ceiling, is very desirable.

Data on sewing-machine lighting in clothing factories were presented by H. O. Stewart in a previous issue of this journal. The conditions found to exist in clothing factories apply in a like manner to glove manufacturing plants. Sewing-machine illumination requires an intensity of approximately ten foot-candles at the needle. On account of its high intensity and the angle at which the light should strike the needle, individual lighting is generally adopted. Four or eight-candlepower lamps, equipped with concentrating me-



Staking and Measuring Machine in Glove Factory.

tallic reflectors, and either mounted rigidly on the machine frame or on a flexible arm fastened to the table, give best results. Reflectors should be so selected and placed that no light is thrown about the room. The following comparison shows strikingly, the value of proper reflectors. A bare eight-candlepower lamp suspended from a drop cord 14 inches above the table gives a 2.5-foot-candle intensity of light at the needle. The same lamp equipped with the proper reflector illuminates the needle with an intensity of ten foot-candles. The bare lamp irritates the operator's eyes as well as those of others about him and furnishes an insufficient amount of light on the work.

Sewing tables 12 feet in length are properly illuminated by two 60-watt tungsten lamps placed 4 feet above the table and equipped with intensive reflectors. This type of illumination is more economical and gives better satisfaction than individual lighting. Eight eight-candlepower carbon lamps would take more than double the power taken by two 60-watt tungsten lamps and the total maintenance cost of lamps and wiring would be much higher.

In those cutting rooms where there are a number of cutting tables placed parallel to each other and moderately close together, a single row of 60-watt tungsten lamps 10 feet apart over each table will furnish ample illumination. The lamps should be 4 feet above the tables and equipped with extensive reflectors. With this layout, the illumination from a row of lamps over a particular table supplies a considerable amount of illumination to the tables on both sides of it, thereby diminishing the intensity of the shadows caused by reason of the cutter bending over his work.

Should it be desired to use only one table, it will be necessary to use the row of lamps on each side of it as well as that over the table. If the tables are not located as indicated above, or where but one table will be used at a time, two rows of 60-watt tungsten lamps should be placed over each table, each row being over the edge of the table. The lamps should be 8 feet apart, 4 feet above the table and equipped with extensive reflectors. This layout will insure ample illumination without shadows.

Commercial Practice
Management, Rates, New Business

Commonwealth Edison Makes Modifications in Battery-Charging Rate.

The Commonwealth Edison Company, Chicago, through George H. Jones, power engineer, announces a number of important modifications in regard to conditions under which the company furnishes electric service for vehicle charging. These changes, which become effective at once, are as follows:

(1) The maximum price for current used in public garages for charging storage batteries has been reduced from 5 to 4 cents per kilowatt-hour, with the stipulation that no charging be done between the hours of 4:00 p. m. and 8:30 p.m., during the standard "peak" months.

(2) The "peak" months have been reduced to four, viz: November, December, January and February, the "peak" hours during these months being from 4:00 p. m. to 8:30 p. m. on every day excepting Sundays. This permits charging to be done between 4:00 p. m. and 8:30 p. m. on Sundays, without the usual "peak" demand charges being made.

(3) The current used during the "off-peak" period will be billed monthly instead of on the yearly basis, which will make a considerable reduction in large garages where the maximum demand may vary considerably from month to month.

(4) The company is at the present time arranging to install in several of its substations in the outlying districts, facilities for giving a boosting charge of 200 amperes. This is of importance to those interested in the use of large trucks.

It is believed by the company that the changes will give impetus to electric-vehicle development in Chicago.

New-Business Meeting in Toledo.

A meeting of the Committee on New Business Co-operations of the Ohio Electric Light Association will be held on Wednesday, February 25, 1914, at Toledo, Ohio.

This Committee decided at its first meeting that because of the fact that practically 90 per cent of the central-station member companies of the Association operated in small cities and other companies were more or less active in the work of the National Electric Light Association that their work should be of such a nature to assist the companies operating in the smaller communities entirely. Believing also that the central stations would be benefited by securing the co-operation of the electrical contractors through suggesting ways and means whereby his business could be increased as well as the central stations, the committee after a considerable thought, arranged the following program:

Paper by H. E. Bonner, manager new-business department Citizens Gas & Electric Company, Elyria, Ohio, entitled, "Plans for Securing New Business in Small Cities."

Paper by N. H. Boynton, National Quality Lamp Division General Electric Company, Cleveland, Ohio, entitled, "How the Electrical Manufacturer is Prepared to Assist the Electrical Contractor in Large or Small Cities and Suggestions Whereby Through the Co-operation of the Electrical Contractor and Central Station New Business Can Be Secured."

Paper by E. L. Callahan, new-business manager, H. M. Byllesby & Company, Chicago, Ill., "Suggestions to Assist Central-Station Salesmen to Secure New Business."

Invitations are being sent out to all the member companies in Ohio with the appeal that they will send to Toledo for the day the men that are responsible for the securing of new business. The member companies are in turn asked to extend the invitation to the electrical contractors in their community and to secure their attendance if possible.

Any person deciding to attend is requested to notify the chairman of the Committee, Thomas F. Kelly, sales manager of the Dayton Power & Light Company, Dayton, Ohio, by February 23 if possible.

Utilities in China.

At the present time only four cities in the extensive domain of China have electric street railways. Three of these operate in British, French and Japanese settlements and only one is a native project.

ELEMENTS OF A STREET-LIGHTING CONTRACT.

By S. B. Way.

Some excellent and original provisions that should be embodied in a street-lighting contract between utility company and municipality are discussed in this paper, which was presented before a recent meeting of the Milwaukee Electrical League. Mr. Way is vice-president of the Milwaukee Electric Railway & Light Company.

The purpose of a street-lighting contract is to provide the basis on which a municipality may obtain street-lighting service upon the most favorable terms. The basis of making such contracts differs materially as between competitive conditions and conditions as they exist in this state today, under state regulation of public utilities. Under competitive conditions, the prices obtained by municipalities would depend to some extent upon what the traffic would bear, and very largely upon the ability of the municipality to establish its own street-lighting system.

Under existing conditions in this state, the prices for utility service is determined upon the basis of the cost of rendering such service by municipally or privately owned utilities, and a street-lighting contract, under conditions of utility regulation partakes of the nature of a franchise for the operation of a utility, such as a street railway, an electric lighting plant, a gas plant, etc.

It is now well recognized by economists and students of public utility affairs that the best type of franchise is one providing for indeterminate duration, but giving to the municipality or the state the right to recapture or own the utility at any time it so desires. Such franchise possesses a distinct advantage, both from the standpoint of the public and the utility over any definite term, and particularly short-term franchises.

Where the utility is operating under a franchise having a definite term, it is well recognized that the cost of service must include a reasonable allowance for the amortization of the value of the physical property over and above any allowance for ordinary depreciation. Such amortization must be of sufficient amount to equal the difference between the cost of the physical property and approximately its scrap value at the end of the term of the franchise. This is necessary because experience in negotiating for extensions to franchises which are about to expire has indicated a decided tendency to take advantage of utilities facing termination of term franchises. With an indeterminate franchise, it cannot be as successfully urged that an allowance for amortization of physical property is necessary, since the utility can be viewed as being required to operate in perpetuity.

Ideal Form of Contract Indeterminate.

From the foregoing considerations and the similarity that exists between a franchise and a contractor for municipal street lighting, it is evident that the ideal form of street-lighting contract would be one having no definite term, but providing for the supply of street-lighting service at cost and for an indefinite period, or until such time as the municipality desires to terminate the contract. The condition of termination, where service has been rendered at cost, would necessarily be that the municipality would be required to take over, at its then present value the special investment made by the utility for the purpose of carrying out the contract, or otherwise compensate the utility for the remaining value rendered useless to the utility by the termination of the contract.

Statutes Limit Contract Period to Ten Years.

This ideal condition cannot, however, be realized, as the statutes of Wisconsin limit the term for which a municipality can execute a street-lighting contract to a period not longer than ten years. It is, therefore, necessary under present statutes to specify a definite term in any actual contract executed between a municipality and a utility. Such a condition is neither advantageous to the municipality nor the utility and has some influence on the cost of service or the price paid by the municipality.

Cost of Street Lighting.

The principal elements constituting the investment in a street-lighting system are, distribution system, manufacturing or generating plant, special station and substation equipment and lamps and lamp supports. The report of the Railroad Commission of Wisconsin, presented to the Street Lighting Committee of the Milwaukee Common Council shows that the investment in a street-lighting system if constructed by the municipality would be apportioned among the foregoing items as follows.

	Per Cent.
Distributing system	71
Generating plant	14.73
Special station and substation equipment	7.38
Lamps and supports	6.89

It will be observed that the distribution system constitutes nearly three-fourths of the total investment, and that the distribution system, together with the special station and substation equipment and the lamps and supports, constitutes over 85 per cent of the total investment. Since the investment in a large part of the distribution system and all of the special station and substation equipment as well as the lamps and supports, must be paid for within the period of the contract, it is evident that the short-time contract must exert a material influence in raising the cost of the service when compared with the long or indeterminate-term contract. This influence can be shown, for a definite case, by taking the figures contained in the report of the Railroad Commission of Wisconsin to the Milwaukee Common Council Street Lighting Committee, covering the estimated cost of street-lighting service under the plan considered by the Commission. The figures given represent the cost per lamp year, subdivided into the principal elments of operating costs and fixed charges which would obtain under term contracts for five years, ten years and an indeterminate period.

	Five-Year Contract.	Ten-Year Contract.	Indeterminate-Term Contract.
Power plant expense	$ 8.75	$ 8.75	$ 8.57
Distribution expense	12.30	12.30	12.30
General and undistributed expense	2.06	2.06	2.06
Interest	19.04	19.04	19.04
Taxes	4.76	4.76	4.76
Depreciation of general equipment not exclusively used for street lighting	6.45	6.45	6.45
Depreciation of special equipment used only for street lighting	22.20	11.10	7.88
	$75.56	$64.46	$61.24

From the foregoing tabulation, it will be noticed that the current ordinary operating expenses or cash cost is the same for each of the contract periods and amounts to $23.11 per lamp year. The fixed charges, including interest, depreciation and taxes, amount to $52.45 per lamp per year in the case of a five-year contract, as compared with $38.13 in the case of an indeterminate-term contract.

Comparative Costs Under Indeterminate Contract and Municipal Ownership.

The basis for calculating the costs of a municipally owned street-lighting system would be the same as that employed in computing the cost of service purchased from a utility under an undeterminate-term contract. It may be interesting, therefore, to compare the foregoing figures, based upon an indeterminate term contract, with the figures contained in the previously mentioned report of the Railroad Commission, concerning the cost of

service with an equivalent municipally owned system. These figures of cost are as follows:

	Indeterminate Term Contract.		Municipally Owned System.	
	Cost.	Per Cent of Total.	Cost.	Per Cent of Total.
Current ordinary expense or cash cost	$23.11	37.8	$31.95	42.6
Fixed charges, including interest, depreciation and taxes or lost taxes	38.13	62.2	43.16	57.4
	$61.24	100.	$75.11	100.

The foregoing figures and comparisons have been made upon the basis of a predetermined number of lamps definitely placed, with certain numbers being supplied from underground and overhead supply circuits, respectively, and upon the presumption that the type of lamp selected, and upon which the operating costs have been based, would be utilized until worn out from natural causes or replaced by other equipment following substantial advances in the art.

System Should Be Kept Modern.

It would be unwise for any municipality to enter into a street-lighting contract that did not require that the system be efficiently maintained and be kept modern. Under the principles of regulation provided by the Public Utility Law and as applied by the Railroad Commission of Wisconsin, the matter of arriving at equitable charges for public-utility service has, in a large measure, been simplified. There now seems to be no way in which either the municipality or the utility can take advantage of each other. No contract can be entered into between a municipality and a utility that will not be subject to review by the Railroad Commission at any time. The Railroad Commission, in its practice of regulation, applies, so far as practicable, the principles of cost analysis to the determination of reasonable charges for service. The cost of services is made up of the several factors hereinbefore enumerated. The value of the property devoted to the particular service is appraised and the annual allowances for interest, depreciation and taxes are determined, and from this analysis and a determination of the reasonable and necessary operating expenses, the cost of the service is computed. As has been seen, the item of depreciation constitutes a relatively large proportion of the total cost of service, and if the term of the contract be less than the natural or useful life of the special equipment required for street-lighting purposes, the difference between the rate of depreciation corresponding to the natural life of such equipment and the actual life, as determined by the term of the contract, must be allowed as special depreciation or amortization. The special equipment useful only for street-lighting purposes and which must be so treated, would ordinarily include lamps, circuit cables or wires, special lamp supports, special underground conduits and the regulating or special apparatus needed in the power plant or substation to render available the particular character of current required for the lamps employed.

Specifications Necessary.

If the price to be included in any street-lighting contract is to be based upon cost analysis, then all uncertain elements entering into the determination of the cost must be eliminated. With a definite specification as to the number and type of lamps to be used, their location and the term of the contract made definite or indeterminate, the cost of the service can be predicted with a high degree of accuracy. Such cost will tend downward as improvements are made in the efficiency of generating equipment, distribution methods and organization, and, under the theory of regulation, a municipality obtaining service under a contract subject to review by a competent regulating body would secure the advantage of any such reduction in operating costs. If, however, the terms of the contract provide severe penalties for outage or failure of lamps to burn, or require the utility to move lamps without limit at the direction of the municipal authorities, and contain no specification as to the number of additional lamps permitted to be added during any year at contract rates, or require the utility to substitute for lamps specified in the contract some new type of lamp, perhaps not known at the time the contract price was estimated, it is clear from a consideration of ordinary business principles, that the estimated cost of the service must contain a liberal item for such contingencies. While it is not only desirable but necessary that the municipality shall have the utmost freedom in relocating lamps, selecting new and improved types and causing the same to be installed, and adding to the street-lighting equipment from time to time, as the growth of the municipality warrants, the fairest, and at the same time the cheapest way for the municipality to retain full latitude and control would come from a provision in the contract requiring the utility to move lamps at cost, to substitute new and improved types upon the cost of service basis, which, of course, would include any unearned depreciation of existing equipment displaced, and a provision under which the municipality might order additional lamps during the last few years of the contract by paying an additional rate therefor, which would protect the utility in the event such new lamps were not continued in service after the date of expiration of the contract. In the event such lamps would be continued under a renewal or extension of the contract, such additional sums so paid should be rebated to the municipality.

Lamps and lamp supports may be owned by the municipality as a means of placing the character of the lamps used within the absolute control of the municipality, but as a change in type of lamps is very likely to make necessary a change in distributing system or special station equipment, the cost of changing the lamps and supports will not, in most cases, cover the entire cost of the substitution. The history of municipally owned street-lighting systems shows that municipalities generally continue the use of lamps and supports long after they have become antiquated and relatively inefficient and that depreciation and obsolescence are not in any manner arrested in favor of municipal undertakings. As the lamps and supports will usually constitute but a small percentage of the total investment, perhaps 7 per cent or less, it is apparent that the matter is relatively unimportant and not in any sense determining. It does not seem difficult to arrange to have the rate contemplate either the municipal ownership of the lamps and supports initially or at the expiration of the contract. Under a contract in which the rates would be based upon the cost of the service, it would probably be found more convenient to require the contractor to substitute lamps at cost and include the cost as a small increment in the rate, than for the municipality to make periodic outlays of relatively large sums to cover such replacements.

Contract.

The principal elements entering into a contract which would be so constructed as to eliminate to the greatest possible extent all uncertainties, and which would permit, therefore, a rate to be calculated upon the cost-of-service basis, and which would, at the same time, permit the municipality the widest latitude in keeping its system modern and up-to-date, in changing the location or character of service supplied to lamps and eliminate the tendency to avoid the installation of needed additional lamps during the last years of the contract, would include the following:

General. A general paragraph providing that it should be the intent of the contract that the municipality should at all times during the life of the contract be provided with adequate and

modern electric street-lighting service, and that it should be the duty of the utility to exercise skill, diligence and foresight to provide continuously the service specified.

Number and Types of Lamps to be Furnished. The initial and minimum number of each type of lamp should be stated and a technical description of each type of lamp should be included, together with a plat showing the location of all lamps covered by the contract. If the lamps are properly described, it becomes a relatively simple matter for the municipality to check the service being furnished by the utility and to assure itself that the service is being rendered in accordance with the specifications.

Lamp Supports. The character of supports used in mounting street lamps can vary over a wide range of design and cost, and the specifications upon which a utility could bid intelligently and accurately should set forth in detail the number and kind of each type of support desired, and upon a plat showing the location of each type of lamp should also be indicated the type of support to be employed.

Character of Service Lines. The elements of cost arising from interest, depreciation and taxes which enter into the calculation of the rate, will be governed largely by the character of service lines specified, that is, whether overhead or underground. In many parts of a large city, underground service is necessary and desirable, and likewise, in many other parts of a city overhead lines serve every needful purpose. To enable a utility to bid closely, the character of service lines wanted for each lamp location should be definitely set forth.

Lighting Schedule. The lighting schedule under which the lamps are to burn must be definitely stated, as, for instance, "every night from one-half hour after sunset until one-half hour before sunrise."

Deductions for Outage. To minimize the time lamps are out of service for any reason is very desirable, as the purpose in making a street-lighting contract is to secure the lighting of the streets. When lamps are out, a valuable police aid has been lost and the citizens of the municipality are inconvenienced through the darkness of the streets. To cause the utility to promptly relight all lamps found not burning, the contract should provide that the utility should employ efficient means for restoring the service, irrespective of when the lamp is reported as being out, and that the contractor should keep a daily record of each lamp reported out, showing the time so reported, the time relighted and should furnish to the properly constituted municipality authority a copy of all such reports, from which deductions from compensation due utility on account of outage could be computed. The deduction for outage may impose a penalty upon the utility so as to cause the contractor to give prompt attention to the restoration of any service interrupted. A pro rata deduction for outage is a severe penalty, since all the utility saved during the period of outage is the energy not used by the lamps out. All other operating expenses and fixed charges continue against the contractor irrespective of whether lamps are burning or not.

Rates. The rates of charge for each type of lighting covered by the contract should be set forth in the contract for the initial installation and should be subdivided as between lamps supplied from overhead distribution systems, as distinguished from those supplied from underground distributing systems. Such separation of cost, as between underground and overhead service will enable municipal authorities to pass more intelligently upon the question of whether the desirability of underground service offsets the added cost.

Additional Service. The contract should provide, in addition to the rates for the initial installation of lamps, rates at which additional lamps can be installed during, say, the first 70 per cent of the contract period. These rates, while based upon the cost of service, should preferably be so arranged, in conjunction with the initial rates, as to invite the installation of additional lamps, and the rates for lamps installed during the first few years of the contract might, therefore, be properly lower than the initial rates. The cost, however, of supplying service to additional lamps will depend, in a great measure, upon the location of such lamps, and the contract should, therefore, contain a provision that where new lamps are ordered at a distance in excess of an agreed maximum that the utility should be paid the added cost of installing such lamps over and above the cost that would occur in making the installations within the agreed maximum distance from any then existing lamp or circuit. For lamps ordered during the last three years or the last 30 per cent of the contract period, the contract should provide that the utility shall install such lamps ordered, subject to a provision that the lamps shall be supplied at contract rates, but that the utility should receive additional compensation to cover the special investment necessarily and especially made for the installation of such lamps and which would be spread over the remaining period of the contract in monthly payments. The contract should contain a provision that, in case a new contract is executed between the municipality and the utility utilizing the equipment so paid for during the latter years of the contract, amounts so paid should be returned to the municipality.

Substitution of Lamps or Service. Subject to review by the Railroad Commission, the municipality should have the right to require the utility to substitute, or the utility should have the right to substitute for the type of lamps specified in the contract, new or improved lamps, of at least equal illuminating power. In case substitution of lamps or other necessary equipment is desired, the party to the contract desiring to make such substitution, should serve upon the other party written notice setting forth in detail the character of lamps and service which it is desired to substitute in place of that covered by the specifications in the contract. The Railroad Commission should not only approve of the substitution desired but should also specify the rates of charge under which the utility would be required to supply the new types of lamps or service.

Compensation for Relocation of Lamps or Change in Character of Service. With the growth of most municipalities, it becomes necessary from time to time to order changes in the location of lamps theretofore installed or in the character of service lines supplying lamps. For such changes in location or in character of service lines, the municipality should compensate the utility for the full net cost of complying with such orders for the reason that no element has been included in the rate to cover such unforeseen expense.

Review by Regulating Commission. The contract may contain a provision that it should at all times be subject to review by the Railroad Commission of Wisconsin as to rates of charge and quality of service furnished. Under the present laws such a provision is unnecessary because the public-utility law already so provides.

A municipal street-lighting contract embodying essentially the provisions just briefly outlined would be a distinct advance in form over any heretofore prepared. It would insure to the municipality a modern system at all times and place at the disposal of the public an efficient operating organization provided by the utility and the economies of large scale production and purchases, while insuring to the utility compensation for the cost of the service rendered. The attainment of these ends is the ultimate object of every fair-minded municipal official and is the guiding policy of every officer of a well managed public utility.

Electric Sign Data

Electric Sign Progress.

It would be impossible to chronicle the progress of electrical advertising on this page each week, for many reasons, chief of which is lack of space. The market for electric signs is almost without limit and the demand is ever increasing. A few of the recent noteworthy installations are mentioned in the succeeding paragraphs, these illustrating, to some extent, the diversified applications of this form of publicity.

An electric sign, four feet long and eighteen inches high, now marks the famous old town of Lee in the Massachusetts Berkshires. The sign is mounted on a wooden pole in the middle of the town common, and burns all night long. It contains six 40-watt tungsten lamps, and the name, "Lee," appears in raised letters which can be read by approaching tourists, in the daytime as well as by night. The sign has already proved itself a profitable investment. It marks the identity of the town and impresses the stranger as he motors through.

In Chicago two new electric signs have recently been built for the Crown Piano Company and the Great Northern Hippodrome. The Crown Piano sign, which is 64 feet long by 40 feet high, combines the company's trademark with "quality talk" in a strong, effective way. The trademark is a jewelled crown set in the center of the letter "O" of the word "Crown," and the white electric rays radiating from this crown are one of the flashing features of the sign. The letter "O" is eight feet high and contains a variety of colored lamps.

This sign contains 2,660 ten-watt Mazda lamps and is located on the roof of a building facing one of Chicago's most prominent boulevards.

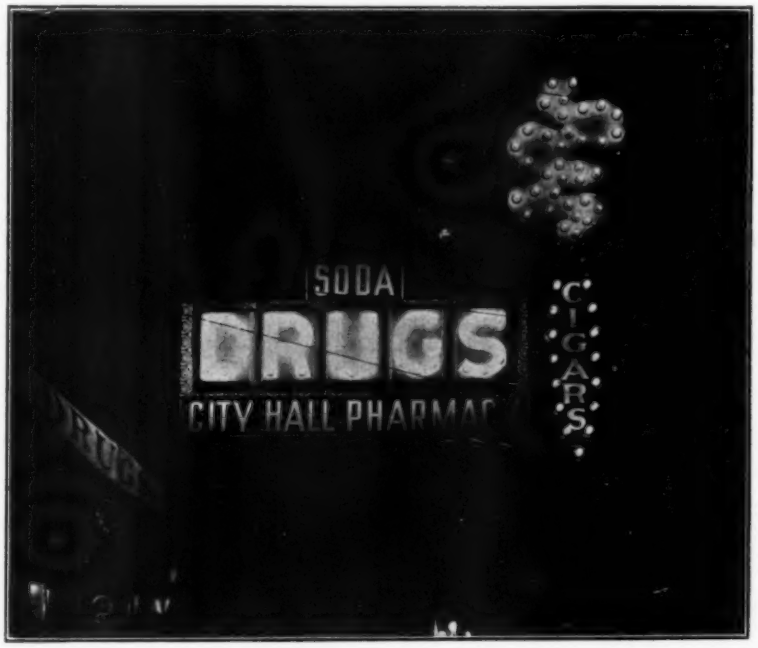
The sign over the entrance to the Great Northern Hippodrome at the corner of State and Quincy Streets, is 45 feet high by 40 feet wide, and contains 1,766 four anl eight candlepower Mazda lamps. The display is first shown with an elephant drinking water from a tank. Then, he raises his trunk and throws a volume of water directly at the theater. This flashing feature is supplemented by a number of others, including a changeable-letter panel which is capable of producing five different flashes per minute. Both the Crown Piano and the Hippodrome signs were sold and built by the Thomas Cusack Company of Chicago, Ill., in co-operation with the Commonwealth Edison Company.

The Fulton (Ky.) Electric Light & Power Company is planning the erection of a large electric sign advertising the community. The cost of maintenance will be borne by the business men.

A large civic slogan sign, 48 feet high, and containing 32,000 lamps, is being erected in San Diego, Cal. It will cost $10,000. Across the top of the sign will apppear, in large letters, the slogan, "San Diego, First Port of Call." The lower half of the sign will be utilized by business firms for their own messages. The San Diego Consolidated Gas & Electric Company will supply the current.

The Thomas Cusack Company, Chicago, has recently erected at various vantage points in Chicago electric signs advertising the La Azora cigar. The signs are 22 feet long by 17 feet high and contain a reproduction of a burning cigar with the words reading, "La Azora, The Cigar of Cigars." Altogether there are eight of these signs and each is located at one of the city's prominent transfer corners.

The contract, it is stated, represents an investment of $16,000.



Electric sign for drug store built by the Federal Sign System (Electric), Chicago, Ill. This particular combination of "Drugs," Soda," and "Cigars" is an excellent one for druggists which combines the publicity value of three separate signs.

The sign is of blue-enameled metal, the word "Drugs" being composed of standard Federal interchangeable letters. 44 lamps are used in the letters and 56 lamps in the cigar and smoke. Red lamps are used at the burning end of the cigar. The sign is a double-faced one.

Electrical Construction

ESTIMATING FOR THE ELECTRICAL CONTRACTOR.

By D. R. Shearer.

The development of the field of electrical contracting has been so rapid in recent years that it has been difficult to keep track of the changes made necessary by varying conditions. Formerly an electrical contractor needed only a screwdriver, a pair of pliers and a small stock of supplies to carry on his business, but from this state the contracting business has grown to a position in the world of business requiring the most careful thought and conscientious attention to every detail for carrying on successfully this line of work.

Three departments are ordinarily found in the business of a modern electrical contractor. The estimating and soliciting department, the construction or erection department and the office or executive department. Each of these departments bears a certain relation to the firm, to the other departments and to the public. The executive department is carried on under business methods which are highly developed and in which there are few chances for error by those who know the proper methods of buying and of bookkeeping. The operating department, too, offers no great difficulties to the foreman who is thoroughly competent, is alive to modern wiring practice, acquainted with the numerous details of electrical installation, and has sufficient executive ability to manage his men and secure from them first-class work and attention to their duties.

The soliciting and estimating department, on the other hand, is subject to many difficulties and is probably harder to manage than either of the other component parts of a contracting firm.

It is the estimator we wish to consider in this brief article, for upon him devolves the responsibility of estimating material, drawing the layout and making bids. Upon his shoulders rests a great responsibility and upon him may depend the success or failure of his employer. Should he make errors and exceed in his estimates the material required for a given job the probabilities are that his bid will be high and the contract go to a more accurate competitor. On the other hand, if he underestimates the material required, his bid may be too low and his firm lose money.

Date_____ Contract No._____

CONTRACT RECORD Sketch No._____

Name_____ Amount of Contract, $_____

Address_____

Remarks

Estimated Cost		Cost	
Material		Material	
Labor		Labor	
Profit		Extras	
Total		Profits	

Per Cent Estimated Profit_____ Per Cent Profit_____

Secured by_____ at_____ Referred to_____

Fig. 1.—Contract Record.

The estimator is placed in the unenviable position of standing between three forces, any or all of which may be unfriendly toward him. That is, he bears a definite relation to his employer, to the workmen who install the work on contracts he has secured, and to the public from which he endeavors to secure business and to whom he must submit his bid.

In his relation to his employer, he must have two aims, to secure business which will net his firm a profit, and at the same time to secure for his firm the good will and confidence of present and future customers. In his relation to the workman, he must ever bear in mind that his designs for installation must be practical and must be satisfactory from the position of a man having the work to do. If he underestimates, some blame may rest on the workmen for using too much material and thus the workman's confidence in the estimator is lowered. The relation of the estimator to the public is even more precarious. He must be diplomatic, careful, and have the full confidence of those to whom he is bidding or for whom he is asked to make estimates.

Many factors enter into the formation of a bid and any one of these factors may destroy the chances of the bidder. Named in the order of their importance, they are as follows: material cost, labor cost, overhead expense, transportation or in-situ cost, contingencies and profit. Some contractors place more prominence on certain of these items than on others and many contractors go so far as to entirely overlook some of these very factors which are so important in the creation of a fair and satisfactory bid. Another factor which many contractors consider very important is that of competition, but this is the last to be considered as well as the least and should rarely enter into consideration when making a bid. The contractor should take the stand that if he cannot secure a given job at a fair profit to himself it would be wise to let his competitor take it from him at a lower bid.

The material cost may be made as accurate as the estimator chooses, or rather this cost may be as accurate as he chooses to make it for a given layout, but this layout may be changed to increase the cost or decrease it as the case may be. This accuracy depends on the amount of time he feels called upon to give to the job. A considerable amount of judgment is required in order to determine just how complete or how good a layout to formulate. One may decrease the cost by changing the plans until an absolutely inferior installation would result, or he can increase the efficiency and completeness of his designs to such a point that the installation cost would be prohibitive. If the estimator can plan an installation so suitable and adequate to the needs of the customer that the customer accepts his layout and will have no other, the hardest part of the fight has been won, for in such a case the customer will require all the other bidders to make their estimates on the same identical installation, excepting, of course, for certain minor details. This step being made, it is necessary for the esti-

mator to work out every possible scheme that might effect a saving in amount of material used or in the labor necessary for its installation. All items of material should be carefully checked over with a view of changing or substituting in such a manner as to retain all the advantages and good points of the layout and yet reduce its cost. Careful measurements should be made for the amount of conduit and wire necessary. The carrying capacity of the wire used should be ample, yet by using too large a margin of safety, the cost is unduly raised. Careful consideration should be given to the proposed methods of installation. The layout should be designed so as not to burden the workmen with unnecessary complications and with labor above that which is necessary. Sometimes it is well even to consider the characteristics of the individual workman, if savings in labor may be effected by so doing. The location and methods of placing switches, cutouts, panelboards, cutins and other functional parts of the system should be determined with an eye single to efficiency and cheapness of installation as long as cheapness may be secured without detracting from the best features. Non-standard fittings and accessories should be avoided, for not only may they be difficult to secure but delayed shipments may result in unnecessary prolongation of the job. It is well for the estimator to have a thorough knowledge of the stock his employer carries and work to the end of using stock material wherever possible. After forming a general mental sketch of a proposed installation, either a complete plan or an adequate pencil sketch should be drawn to be used by the foremen if the job is secured and to be filed as reference regarding similar future installations if the contract is lost. With this sketch as a basis for a complete list of the material and fittings necessary and a good mental idea of the way the work should be installed, the estimator is in a position to figure on the labor. There are many methods used in estimating labor costs but perhaps the most accurate is that of comparing the time required by the workmen employed by the given contractor for installing work of a similar nature. The amount of work done varies greatly with the locality, the type of men employed and their training, and with the practice of the contractor. Adequate data should be kept on the amount of time required to complete different items of installation under certain conditions and this data used on future estimates.

In considering material costs, we find that several factors enter into the price at which material may be furnished at a cost basis. The greatest part of this amount or basis from which we may work is the invoice price. This in itself is a variable quantity for each item and depends upon the house from which it is purchased, the quantity in which the material is bought and upon the buyer's ability to recognize low prices when they are furnished him. Of course, there is supposed to be a reasonable uniformity in the prices at which jobbers sell to the contractors, but owing to certain conditions and the circumstances of the jobber, these prices may vary to a considerable extent on the same class and quantity of goods. One jobber may become overstocked on some article which he desires to close out at practically cost and so special inducements are frequently made to the contractor even on small quantities for immediate delivery. Thus, although against the practice of some buyers, it is well to keep in contact with several jobbing houses and it is usually

DAILY WORK REPORT

Name _____

Address _____

Order No. _____ Class of Work _____

Ordered by _____

Date Started _____ Date Finished _____

Date Sent to Inspector _____

Inspector's Report _____

_____

Unfinished _____

_____

Extras _____

_____

_____

_____

Workman _____

Helper _____

Signed _____

Remarks _____

_____

(OVER)

Fig. 2.—Daily Work Report.

found advisable to purchase certain supplies from one house and other material from other houses. In some instances, a considerable saving may be effected by buying direct from the manufacturer, as theoretically he is able to furnish goods more cheaply than the jobber. Another item that goes far toward reducing the cost of supplies is the cash discount allowed by practically all jobbers and manufacturers. Although this is usually only 2, 3 or 5 per cent, this small percentage is just that much towards reducing the basic cost. Another factor that sometimes plays an important part in the cost of certain lines of material is delivery. Frequently savings may be made by changing points of shipment or by routing the shipment over different roads. Breakage, too, on fragile material necessarily increases the cost and on top of all these items which go to make up a cost price, we must add drayage and stock-room handling.

The efficiency of the stock-keeper is difficult to classify as it may come under the head of either material costs or labor costs. By the efficiency of the stock-keeper, we mean the accuracy with which he keeps his records and the care he uses in measuring and charging out material used. Nevertheless his efficiency affects the gross cost of practically all the supplies used. The estimator should have a thorough knowledge of these cost factors and should have a mental idea of the relative proportion they bear toward the whole.

The labor cost is made up primarily of the rates at which the men are paid, but here again certain additions must be made to this basis of cost. For instance, the accuracy with which the foreman keeps the time of the individual workman and the time which is lost in transit and freight on materials to the point of installation. The foreman's time or salary also furnishes an item of cost from the labor point of view and must be considered when estimating a job of any size.

The overhead running expense is an item of cost which is rarely thoroughly understood by an estimator but nevertheless ranks third in importance in making up a bid. Different contracting concerns classify their overhead cost in different manners, but in the writer's opinion the overhead should be made up of the following items; salaries of the officials and office employees or any other money expended for labor or services which cannot be directly charged out to a given job, rent, advertising, telegraph and telephone expenses, freight and express charges which cannot be charged out against material or installation work, light, heat, upkeep of tools and accessories, office-fixture depreciation, depreciation of stock, insurance (both fire and liability), stationery, taxes, license, inspection fees and any other items whatsoever that are not or cannot be charged directly to the customer. The overhead costs will vary greatly in different localities and with the efficiency in management of any concern. Perhaps the best way to get at the overhead expense is to work by the time periods. That is, we check over our costs for a given period of time, either six months or a year, and take the relation of the expenses to the gross amount of business done during the same period, evaluated as a percentage. To be more accurate, these overhead expenses should be proportioned not to the gross amount of business, but to the business done less the profit. However, by holding in mind the methods by which we arrive at an overhead percentage, we can secure accurate results in estimating by either system.

It is seen from this outline of the busi-

ness procedure of an electrical contracting concern that the estimator and solicitor should be thoroughly acquainted with every detail going to make up a net cost. He should not only hold in mind these cost factors but should have files and records to which he may refer as an assistance on every contract of any size. To prove the most efficiently helpful, these records for the use of the estimator must be made up of partial records from each of the three departments, that is, from the executive, the installation department and from records made by the estimator himself. A record card of this type is shown in Fig. 1. It is noted that on this card we have two distinct columns, the first to be filled entirely by the estimator, the second to be filled by the foreman and office. Thus, after writing out the name and address of the customer, the date and name of the estimator and a sketch of the work to be done on the back of the card, the estimator fills in the assumed cost, the assumed profit and the bid he has made to the customer. This card is placed in the live file and there it remains until the contract is let, either to the bidder or to a competitor. In the first case, the card is transferred to the working file, where it remains until the job has been completed and the right-hand column filled in by the bookkeeping department, after which it is transferred to the dead file for future reference. In case the bid is let to a competitor, his name and bid are secured, if possible, and placed on the card, after which it also is transferred to the dead file. If this card system is carefully kept up it will prove an invaluable aid to any man who does estimating.

SOLICITOR'S REPORT DATE

CALLED ON	REMARKS	FUTURE ENGAGEMENT

Fig. 3.—Solicitor's Report.

In Fig. 2 is shown another card which is filled in complete by the foreman and placed in the same file with the cost-keeping card. It is really considered an aid or an accessory to the cost card and the two are usually considered as a unit. In Fig. 3 is shown still another card which is used by the estimator and kept for his own benefit in tracing prospects and in keeping tab on engagements. By reference to this file, the chief executive of a contracting firm is able to determine how closely his solicitor or estimator follows up prospects.

The last factor we shall consider entering into the make-up of a bid is the profit. This is the most variable and most elastic of all the factors considered. It may be much less than nothing or it is possible that it can be as large as all the other factors combined. Many concerns favor the use of a fixed percentage of profit, but this will rarely be found feasible. For instance, on certain classes of work where unforeseen contingencies may arise, 75 per cent net profit may not be too high to figure, while in other cases when selling wire or conduit or some other staple 5 per cent may be considered high. Again, that material which is turned over rapidly and depreciates but little may be sold at a closer margin than other lines which move slowly and are subject to greater depreciation, such as ornamental fixtures, heating devices, electrical toys and items of like nature.

Returning once more to estimating proper, it may not be amiss to review briefly a line of procedure to be followed by an estimator in arriving at a bid on a certain installation.

Assuming that he knows the material costs of his concern as furnished him by the buyer, the labor cost as furnished him by the foreman and the overhead percentage supplied by the office, he should first take a general view of the plans for the given installation, or if full plans and specifications are not furnished, of the location of the installation itself, and after getting a general idea of the requirements, make a preliminary sketch of the work he proposes to do. The proposed installation must be looked at from every possible point of view, taking into account the location, the surroundings, the class of work to be done and any other factors that may bear directly or indirectly on the ease or efficiency with which the work may be done. He should next accurately measure for the material required, either on the blueprints or on the job and tabulate each class by itself. After every item of material that is found to be necessary is arranged and listed conveniently, the labor should be estimated. Frequently in this work, the consultation or advice of the foreman is a valuable adjunct. When this preliminary work has been done, the estimator adds the material and labor costs and figures the overhead to be allowed. This gives him the net cost of the given job and upon this a fair and just profit should be added. He is now ready to draft a bid, but before doing so should again go over the plans and specifications, whether made by the architect or by himself, to see if any items have been omitted or if any changes in the wording are necessary. In doing this, he must have in mind the legal aspects of the contract and see that no clauses occur which might be prejudicial to his employer. The bid may then be submitted.

From this outline, it might seem that too much is expected of an estimator, but whether he be one whose sole duty it is to make estimates, or an executive of the concern having other duties, it is necessary that very close attention be given to this phase of the electrical contractor's business.

New York Code Ruling.

In an effort to secure a standard interpretation of the switchboard wiring requirements contained in Rule 2*b*, third and fourth paragraphs of the Electrical Code of The City of New York, the Commissioner of Water Supply, Gas and Electricity has established the following ruling:

Where a tight non-combustible outer cover is required, compliance with Rule 2*b* will be deemed to have been secured if asbestos tape is wound helically over the inflammable outer braiding, then wrapped with light twine or heavy pack thread, and then painted with soluble glass; or, if a braided asbestos tubing is drawn over the insulated wires and secured in place at the ends by means of twine or pack thread and then painted with soluble glass.

It should be noted that in either case care must be taken to leave about two inches of the inflammable braiding free from this fireproofing covering at lugs and terminal connections, and also to keep the flameproofed wires away from all live metal parts.

Important Canadian Development.

The Winnipeg Electric Railway Company has engaged the J. G. White Engineering Corporation to plan a development of 100,000 horsepower near the city of Winnipeg, Canada. There will be an initial development of 40,000 hydroelectric horsepower.

THE ELECTRICAL CONTRACTOR[1].

By Louis Kalischer.[2]

When you consider that all branches of the electrical business have grown up in the past generation, the tremendous strides that have been made are really remarkable.

Formerly, one organization encompassed the entire field; but the rapid expansion brought about a number of subdivisions: notably, the central station, the manufacturer, the supply house, the consulting engineer and the contractor. The contractor is the only one of the units that is brought in direct contact with each of the others, as well as the most important of all, the customer; and his efficiency—is directly proportional to the kind of contact; a poor contact at any point, will result in heat and may cause the temperature of all to rise.

He is expected to know all forms of the lighting company's contracts and the service in all parts of the city; he is expected to be familiar with every device and appliance on the market; he must know where to get the material best suited for the work, at the right price; know all the Underwriters' and City Departments' requirements and, sometimes, the interpretations of the rules of the individual inspectors; he must have a good knowledge of building construction, be a good judge of workmen, and at times he is expected to know what the customer will need for future expansion.

He must be equipped with a complete set of measuring instruments, be able to make accurate tests on engines, generators, motors, etc., either to locate the trouble or give advice; and if awarded the contract, he must back his judgment with his own money as to the cost of labor and material to do the work, and follow, at times, an ambiguous specification, combining all the items and complete the work to the entire satisfaction of all parties concerned—he is the shock-absorber of the electrical business, as it were.

From the time he spends his first dollar estimating on the work, until he puts the final payment in the bank, he has been "going some."

There is another feature that I should like to say a few words about; that is, estimating.

First, there is the contractor that knows the cost of the work and the cost of his overhead; second, the one that has a general knowledge, but does not know what his cost of doing business is; third, the fly-by-night concern that has an angel to back it. They usually last about a year, as it takes about that length of time to complete the various jobs; the manager usually makes one job wash another. The time also depends, of course, on how much the angel can be separated from. I know of one that let go of $50,000 before he was satisfied to call "quits."

Fourth, the erratic bidder, who on some work is very low, and on others is very high. He causes the most trouble. His high bid is laughed at and put into the W. B. file; but his low bid, if it is considered at all, is sometimes used to sandbag the man who had put in a legitimate estimate for the work to be done. He is the man who always tells you that the successful bidder is going to lose money on the job because he imagines the work was awarded at a figure lower than his.

We also have the customer who is quite sure that the lighting company and the various inspection departments are merely adjuncts of our organization; and, when his building is about 80 per cent complete, wants current at once, and believes you are neglecting him in a most shameful manner.

The representatives of the lighting company and the inspection departments know only too well that the contractors do their utmost to secure service for them, and I want to, here and now, acknowledge, on behalf of the Electrical Contractors' Association of Long Island and myself, the kindly assistance that the Edison Company and the inspection departments render us—also the big manufacturing companies who are always willing to place at our disposal engineering data, and their engineers, if necessary.

There is only one way to properly handle the conditions as outlined, and that is, by inducing the majority of the contractors to join an organization such as the Electrical Contractors' Association of Long Island. The co-related interests are only too anxious to help the contractor, even to the extent of changing their rules, if the matter has been thoroughly discussed by the various contractors and a better solution offered. Our Association is always ready and willing to assist a member with its experience—to permit him to successfully carry out his contracts, and leave a fair margin of profit for himself—and, when all is said and done, aside from the pleasure of solving the various problems, this is a matter of most importance; otherwise, there would be no contractors.

1 Response to a toast at dinner given by Edison Electric Illuminating Company to Brooklyn contractors.

2 President of Electrical Contractors' Association of Long Island.

The use of electric signs is slowly but steadily increasing in Hongkong, China. Even flashing signs are coming into use.

Local Organizations in Iowa.

The activities of George W. Hill, of the National Electrical Contractors' Association, have been evidenced in Iowa by the formation of local organizations in Marshalltown and Waterloo.

In Marshalltown a meeting was held on January 11 and organization effected by the election of J. Boughton, of the Buchanan Boughton Company, as president; E. N. Peak, of the McCarten Plumbing Company, as secretary; and Charles Munson, of the Iowa Railway & Light Company, as treasurer. This organization is not confined to electrical contractors, but will be in the nature of an electric club for all interests.

The Waterloo Electric Club, which will meet weekly, has elected the following officers: president, H. R. Plowman, of the Black Hawk Electric Company; secretary, M. T. Humphrey, of Hitchcock & Humphrey; treasurer, J. A. Hartleip, of the Waterloo Electrical Supply Company.

Among the Contractors.

Hampton & Buerke, Tampa, Fla., have secured a contract to install a "White Way" on the Bay Shore Boulevard through Wallcraft, a suburb of the city; also the contract for wiring the new Mugge Hotel.

The Lafayette Plumbing & Electric Company has been organized in Lafayette, Ga., and has been given the privilege of handling electric supplies exclusively, the municipality, which heretofore dealt in this kind of goods, turning over this department to the new concern, which started business February 1.

The Grossman Electric Company, 1532 South Fourth Street, Philadelphia, has just completed the wiring in a six-story concrete building for the Penn Card and Paper Company. Conduit was used throughout.

L. R. Barton, of Richmond, N. Y., has the contract for wiring the new Moravian Parish House at New Dorp, Staten Island.

W. C. L. McCoy, Lincoln, Neb., has started a contracting and motor-repair business at 302 South Twelfth Street.

Charles E. Strong has started an electrical contracting business at 60 East Sixth Street, St. Paul, Minn.

The William A. Carrao Electric Company, of St. Louis, has the contract for wiring the Warwick Hotel, in that city.

National Association of Electrical Inspectors.

THOMAS HENRY DAY, president, 59 Deerfield Street, Hartford, Conn.
H. S. WYNKOOP, vice-president, 13 Park Row, New York, N. Y.
WILLIAM LINCOLN SMITH, secretary and treasurer, Concord, Mass.
JAMES E. COLE, Representative on Electrical Committee of National Fire Protection Association, 11 Wareham Street, Boston, Mass.
J. E. LATTA, assistant secretary.

Executive Committee

EUGENE N. DAVIS, chairman, Brookline, Mass.

Frank R. Daniel, R. P. Strong, Henry A. Knight, C. H. Fletcher
Washington Devereux, James B. McCarthy, James H. Fenton
R. J. Forsyth, C. W. Mitchell, A. W. Hopkins, G. W. Perry
George L. Collison, T. H. Fritts, A. H. Soper
T. W. Bowry, F. G. Hartwell, A. A. Moffitt, Thomas D. McColl

Secretary's Message.

The Secretary takes pleasure in announcing the organization of the Philadelphia Section, N. A. E. I., which has the following officers: president, A. H. Lilley, 3826 North Seventh Street; vice president, W. W. Hollingsworth, 2252 North Twelfth Street; secretary and treasurer,. W. H. Hall, 5243 Addison Street; representatives on the Executive Committee, N. A. E. I., Washington Devereux, 131 South Fourth Street, and A. H. Engle, 6643 North Eighth Street.

He also is pleased to announce the reception into the Association of the New York Section which starts with 36 members, headed by a gentleman whom many of us know, and the better we know him the more we esteem him, J. C. Forsyth. The Secretary regrets that he has not at hand the list of officers of the Section, which must lay over until a later message.

The third piece of information is that under the section in the new Articles relating to membership, honorary membership has been conferred upon James E. Cole, commissioner of wires of the City of Boston. This is not the place to enter upon an appreciation of our friend and yet the Secretary cannot record the above fact without adding a word or two. Mr. Cole has been twice president of the Association and has continually been its representative upon the Electrical Committee, first of the National Board of Fire Underwriters, and later of the National Fire Protection Association. No one can overestimate the value of the work he has done for the Association, active in office, wise in advice, never hesitating to go on foot or out of his way to assist and serve its interests. 260 questions have been sent out for this department of our work and every one has had a thoughtful and carefully considered reply from Mr. Cole. In the Eastern Massachusetts Section, the meetings of which are frequently held in his office, his judgment and judicious counsel are sought by us all, and always to our benefit. Our President in the course of his business was in Boston yesterday and dined with the Secretary, and in the course of conversation said only he himself knew how often he had sought and been guided by Mr. Cole's advice in Association matters and every time events had proved that the advice was correct.

If our worthy President does not like that he has only himself to blame since he himself in the course of said dinner officially directed the Secretary to present our new Honorary Member with a metaphorical bouquet, which duty he has tried to perform, well knowing how inadequate it is. It is pleasant to add for the benefit of the members who have not a copy of the Articles at hand, that the clause on honorary membership closes "such membership carries with it all the rights and privileges of active membership."

As one of our sister electrical organizations has chosen a slogan which apparently has become somewhat widely recognized (see February 7 issue of ELECTRICAL REVIEW AND WESTERN ELECTRICIAN), "Do it Electrically," our President and advisers have thought it no more than our duty to follow such an excellent example and adopt a slogan also, one which we propose to make just as full of meaning as we can and as an Association stand to flatly and at all times. It is this: "LET THE CODE DECIDE." These words will hereafter appear somewhere visibly in connection with all our activities. In a very little while the Secretary will be able to print (at least he has been so promised) an article by our President explaining what he believes this slogan should mean for us and accordingly he does not intend here to enlarge upon it. He cannot, however, help adding that while it certainly does not mean that we look upon the Code like a law of the Medes and Persians, nor that each of us may not see some point where if he had his way it might be changed, yet each must recognize that the Code as it stands is assuredly the result of ripe judgment, carefully considered experience, soberly considered estimation and weighing of facts and arguments, by as well prepared, selected, and earnest a body of men as ever attempted such a work. If you do not believe it, get the record of that first meeting of the National Conference on Standard Electrical Rules, which opened at 10 a. m., March 18, 1896, at the rooms of the American Society of Mechanical Engineers on West Thirty-first Street, New York (a date we should all remember), and read it carefully; then study the records of the successive meetings down to the present day and you will begin to realize what has gone into the making of the Code, how much greater it is than any one man's or any one body of men's opinion—not because it is the fiat and say so of a committee, but because it is the outcome and unmeasured and united effort to establish electrical construction and installations upon as solid and unshakable a foundation of security as our experience up to the present day can afford.

Finally the Secretary may say that in view of the number of sections or-

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

ganized, certain changes in the Executive Committee are made necessary which will be stated later when completed.

The questions which follow are clear and require no comment, with the exception of No. 254. In this will be noticed quite a marked divergence of opinion. The Secretary recommends the reading of this Rule 67*j* carefully. and especially the third fine-print note, which is where the point arises and which reads "For three-wire systems cutouts must have the break distance required for circuits of the potential of the outside wires."

It will be observed that the word here is "systems," not "circuits." Circuits is used a little further on and personally I must confess that I can get no other meaning from this wording than a requirement for the larger break distance in the case mentioned, as I cannot see how it can be argued that this two-wire tap circuit is not a part of the three-wire "system" to which it is attached, although possibly it is not a part of the three-wire "circuit."

This provision is identical with the same note in the 1911 Code, while the rule governing grounding has changed the word "may" to "must." It seems to me that if you bear this in mind and make a few sketches of what may happen under varying conditions the reason for the note will be clear enough. Whether the larger break distance is necessary with a solidly grounded neutral has nothing to do with the question; it may be or it may not, but it does seem to me that the requirement is plain and I feel positive it is safe.

Small Wires in Parallel.

Question 252. Does the Code anywhere approve (or not allow) the use of small wires in parallel in place of one larger cable? If not, what is considered good practice in this regard?

Answer 1 (W). I do not know of any Code ruling on this question, either for or against. In some places it might be advisable to use smaller wires in parallel in place of a very large wire.

Answer 2 (D). The paralleling of conductors is permissible so long as the adequate capacity is provided.

Answer 3 (U). I do not know of any Code rule, but I should object. First, there is no rated capacity for a number of wires so connected, the rating being for single conductor or several bare conductors stranded together. If one wire became broken, the others would be called upon to carry more current than figured on. In a stranded cable this is not apt to occur and if it did would only diminish the capacity to a very slight extent.

Answer 4 (V). Where main feeder wires are of large size it is considered good practice to allow the use of two or more wires for each main, the total carrying capacity of course being sufficient to carry load.

Answer 5 (O). It could not be considered good practice at any time to use several wires in parallel in place of one larger wire of sufficient capacity; it is not, however, specifically prohibited by the Code.

Answer 6 (Y). The Code does not prohibit this type of wiring but I would consider it inadvisable, owing to the liability of some of the smaller wires becoming broken and overloading the remainder.

Answer 7 (R). Not referred to in the Code at all.

Answer 8 (B). I know of no provision in the Code that specifically permits or condemns the running of small wires in parallel in place of one larger cable (except of course the combination of small conductors under one insulation as a flexible conductor) and while in some cases it may be necessary or advisable, as a general proposition it would be poor practice.

Answer 9 (N). I consider this to be purely an engineering question; should never think of combining four No. 14 to get No. 8, where I might think it wise to use two 0 wires instead of one 0000 conductor.

Answer 10 (E). I know of no rule in the Code where this method of construction is spoken of. I have seen it used, however, with the several wires tied in to each other and the combined wires protected by a fuse equal to the combined carrying capacity of the wires.

Answer 11 (Q). Code does not approve the use of two small wires in parallel in place of one large wire. If there is good reason for doing this, wire should be cabled.

Answer 12 (H). I think the Code is silent on this question, but using a divided circuit is not in general good practice.

Answer 13 (P). The intent of the Code is against the placing of small conductors in parallel in place of using a larger cable. Perhaps the best proof lies in the fact that nowhere in the Code is provision made for fusing arrangements for such parallel conductors.

Our practice is to permit this paralleling only where an existing line must be reinforced, or where the ampere capacity required exceeds the limits of any cable that might ordinarily be placed conveniently in the location under consideration. For these larger sizes we consider it good practice to tie the cables together at the far end by means of a busbar, and to tie them together at the near end through individual fuses so selected that they will blow when pumping current back through a ground on a cable, the fuse of which has already blown, before this current can exceed the carrying capacity of the cable in question.

Answer 14 (S). I do not find anything in the Code that gives the information asked for. I should require each wire or cable protected by a fuse. Rule 18-a should be complied with for protecting each wire or cable.

Answer 15 (X). Code neither approves nor prohibits using small wires in parallel in lieu of one of a larger size.

Good practice consists in bending to the conditions to be faced.

Fuses in Parallel.

Qestion 253. How would the above question (252) apply in regard to fuses in parallel?

Answer 1 (W). The Code nowhere prohibits their use.

Answer 2 (D). As regards fuses, same are approved in parallel where capacity exceeds 600 amperes.

Answed 3 (U). The Code nowhere even refers to such practice.

Answer 4 (V). There is nothing in the Code bearing on the matter.

Answer 5 (O). The use of fuses in parallel could in no case be considered standard or the equivalent of a larger fuse of proper capacity. In case of overload the fuses would operate at different times and the last fuse to blow would probably be called upon to break an arc much heavier than that for which it was designed, with probable disastrous results to the fuse.

Answer 6 (Y). The Code does not refer to parallel fuses but it is bad practice as in case of a broken wire the overload on the balance would open the fuses and the temptation to overfuse would be very great.

Answer 7 (R). Not referred to in the Code at all.

Answer 8 (B). See answer to Question 252.

Answer 9 (N). This appears to me always and everywhere an unfortunate practice, but it may occasionally be almost necessary.

Answer 10 (E). A single fuse equal to the combined wire capacity should be used.

Answer 11 (Q). Fuse in parallel is not considered good practice. There are conditions, however, under which it will be almost necessary to do this and approval could be given if the work were properly done.

Answer 12 (H). It strikes me that fuses located as indicated would be simply foolishness.

Answer 13 (P). In some cases we have been obliged to authorize the placing of several fuses in parallel in order to secure a capacity in excess of the largest cartridge fuse. Our experience has been that if one fuse fails, they all fail, and they, therefore, serve the same purpose as if one large fuse had been employed.

Answer 14 (S). The Code is silent in regard to fuses in parallel. I see no objection to fuses so installed.

Answer 15 (X). Code does not rule on fuses in parallel in this sense.

Break Distance for Cutout.

Question 254. Referring to the third note to Rule 67j, what must be the break distance for a two-wire link-fuse cutout on a 110-volt lighting circuit taken from one side of a 110-220-volt, three-wire system?

Answer 1 (W). This being a two-wire cutout on one side of a three-wire system (it being impossible to impress a voltage of over 110 on cutout) it would take the 125-volt spacing.

Answer 2 (D). I think a distance of at least two inches should be required.

Answer 3 (U). When a two-wire cutout is used, it calls for 125-volt spacing. When a three-wire cutout is used, it calls for 250-volt spacing.

Answer 4 (V). Should stick to the spacings of the two tables.

Answer 5 (Y). Break distance as required for 125 volts of rated capacity.

Answer 6 (B). The break distance on a two-wire link-fuse cutout for a lighting circuit taken from one side of a 125-250-volt circuit should be that required by the Code for 250-volt cutouts. The distance between opposite poles may be that specified for 125-volt cutouts.

Answer 7 (E). I would ask for the spacings that appear in the 125-volt table of the rule.

Answer 8 (Q). Three-fourths inch for ten amperes or less.

Answer 9 (H). From 1.25 to 2 inches, depending upon the amperage.

Answer 10 (P). I should rule that in the case of a two-wire cutout, the other side of the three-wire circuit, which is not carried on the cutout, should be disregarded; and accordingly I would point to the first table of Rule 67*j*, "Not over 125 volts," as indicating the minimum break distance required.

Answer 11 (S). Rule 67*j* takes care of the fuses for mains and branch circuits of a three-wire system in the fine-print note.

Answer 12 (X). Code rules maximum voltage. If the three-wire system is inside then the voltage of the outside wires of the system governs. If one side only is used it is obvious that the maximum is in use. It is also obvious that to constitute a three-wire system all the voltages must be accessible.

Answer 13 (N). The Rule appears perfectly plain, the third fine-print note being clear enough. A two-wire branch or tap circuit from one side of a three-wire submain is a part of a three-wire system by all the Code intimations as well as engineering meaning of the word "system" and 250-volt spacing should be uniformly demanded.

Answer 14 (O). The branch circuit described is a 110-volt circuit and the spacing for the cutout should conform to Rule 67*j*, first table headed "Not over 125 volts."

New Street Lighting in Providence.

The Narragansett Electric Lighting Company, Providence, R. I., for the past year has been changing the street lighting system of the city of Providence, making an installation of 1,600 6.6-ampere magnetite arc lamps and about 7,500 60-candlepower incandescent lamps. These lamps replace an installation of 1,900 old-type 9.6-ampere open arc lamps and about 2,500 32-candlepower incandescents.

The installation is about two-thirds completed and will be finished some time in the spring.

Savannah River Plant Starts Operation.

On February 16 the city of Augusta, Ga., celebrated the opening of the hydroelectric power plant located on the Savannah River, nine miles above the city. Since that date energy has been supplied from the new plant and the steam station of the Augusta-Aitken Railway & Electric Corporation has been shut down. An excursion was arranged in the morning by the company to visit the power plant. The dam and power house were inspected and a barbecue was arranged at Stevens Creek. In the evening there was a banquet with speeches by Governor Slayton, municipal officials and an executive of the J. G. White Management Corporation.

Current is transmitted to the city at 44,000 volts. The plant has a capacity of 24,000 horsepower. The dam is 2,000 feet long and 27 feet high and forms a reservoir with an area of 4,000 acres.

Longitude Determined by Wireless.

Wireless experiments which have been carried on between the Eiffel Tower in Paris and the Arlington Station at Washington have resulted in a correction to the figures previously obtained for the difference of longitude between these points. This correction is equivalent to a distance of 279 feet, the two stations being that much further apart than previously supposed. The distance between the two stations is 3,860 miles.

Three hundred tests were made altogether in exchanging signals, and the time records of sending and receiving were compared with astronomical observations made upon a selected list of 60 stars. The time for the double transmission of signals, that is, across the ocean and back, was 0.063 second.

American Society for Fire Prevention.

The organization meeting of the American Society for Fire Prevention was held on February 11 in New York City. The Society is incorporated under the laws of the state of New York. Charles W. Abrams was elected treasurer, Bernard Glaser secretary, and Abram Herbst director of safety.

The object of the Society is to carry on an aggressive and militant campaign for fire prevention in all parts of the United States. It will endeavor to point out just what should be done and how to do it. Arrangements have been completed for the issuance of a monthly magazine known as Fire Prevention, which will be its official organ.

The use of pumps operated by electricity, in connection with the city water supply, is being considered.

Public Service Commissions

CALIFORNIA.

Pacific Telephone & Telegraph Company. The Commission authorized the company to put in effect a new schedule of rates for telephone service to subscribers in the City of Eagle Rock. These rates are established for service connecting telephone subscribers of Eagle Rock directly with the Los Angeles exchange and are based on the Los Angeles exchange rates plus an average mileage of one-half mile for the entire city of Eagle Rock.

Home Telephone & Telegraph Company of Santa Barbara is authorized to issue three notes, in the aggregate amounting to $20,000, in renewal of notes now outstanding.

Coast Counties Gas & Electric Company is authorized to issue $150,000, face value of debentures bearing six per cent interest, to be sold at not less than 93.

Southern California Edison Company. The Commission authorized the company to sell its bonds, which were authorized to sell at 92, at 89 and granted an extension of the time in which bonds may be sold from January 30, 1914, to January 30, 1915.

E. M. Wilson et. al. were granted a certificate of public convenience and necessity to construct and operate an electrical distributing system so as to serve the towns of Biever and Lookout in Modoc County.

IDAHO.

Lewiston-Clarkston Improvement Company. The Company applied for authority to file and publish on less than statutory notice a supplement changing its rate schedule. The amendment provided a material reduction in the Company's rates and the Commission granted the application.

Pocatello Gas & Power Company. The application of the Company for authority to change its schedule on less than statutory notice was granted. One of the changes established a rule requiring a minimum deposit of $3.00 to be made by all non-property owners as a guarantee for payment of bills.

ILLINOIS.

The Springfield Gas & Electric Company and **Peoria Water Works Company** are respondents in cases brought before the Commission on complaint of the cities. These are the first utility rate cases on the Commission's docket and a decision in these matters will no doubt show the Commission's policy in investigation for rate making purposes.

KENTUCKY.

A bill, providing for regulation of public utilities, and following closely the provisions of the Ohio law, has been introduced.

MISSOURI.

The Missouri Electric, Gas, Street Railway & Water Works Association has appointed a conference committee to co-operate with the Public Service Commission in working out a satisfactory uniform classification of accounts and form of annual report.

NEW JERSEY.

Winthrop M. Daniels, chairman of the Board of Public Utility Commissioners, has been appointed by President Wilson to the Interstate Commerce Commission. John L. Treacy of Jersey City has been appointed to fill the vacancy on the Board.

NEW YORK.

Amendment to Public Service Commissions Law. An amendment was introduced in the Assembly providing that no county in the First Public Service Commission District shall have more than two resident commissioners. If a commissioner for such district changes his residence to another state, or to the Second District, or to a county other than the one in which he resides, such change shall operate as a forfeiture of his office. Existing appointments are not to be affected.

OHIO.

Cleveland Electric Illuminating Company. The City of Cleveland has applied to the Commission asking that a valuation be made of the property of the electric company, a subsidiary of the Central States Electric Corporation, to be used as the basis for determining reasonable rates for electric service.

PENNSYLVANIA.

General Order No. 2. A general order has been issued relating to the regulation of the crossing of the facilities of one public service company with those of another public service company.

WISCONSIN.

Mineral Point Public Service Company. The Railroad Commission has approved an issue of $200,000 par value of six-per-cent bonds by the Mineral Point Public Service Company, the proceeds to be used in paying off outstanding indebtednesses, making extensions and additions to the property and in paying reorganization expenses. Inasmuch as the contemplated expenditures include interest and premiums on bonds, etc., which are not chargeable to the capital account, the company will be required to set aside each year such a sum that when the present issue of bonds shall become due the total amount so set aside shall be sufficient to discharge an amount of bonds equal to the foregoing uncapitalized expenditures.

Fond du Lac Telephone Company. The petition of the Fond du Lac Telephone Company requesting permission to extend its lines has been denied by the Commission on the ground that the district to be served by the proposed extension is now adequately served by the Eastern Wisconsin Telephone Company, a party to the proceedings.

Milwaukee Consolidation. The purchase of the property of the Central Heating Company of Milwaukee by the Milwaukee Electric Railway and Light Company has been approved by the Commission. Authority has also been granted the Wisconsin Public Service Company to acquire by purchase the property of the Green Bay Gas and Electric Company, located at Green Bay.

Dodgeville Service. An order has been issued by the Commission requiring the Dodgeville Electric Light and Power Company to thoroughly overhaul its entire system so as to give service in full compliance with the standards of service. The order provides that the company shall engage some competent engineer who understands the needs of the system; that the Commission shall be notified concerning the securing of such service; that the complete plans and specifications covering the new equipment and changes be filed with the Commission within 30 days after the engineer shall

have been engaged; that the work of rehabilitation be completed within 60 days. The above order was issued only after the company had repeatedly refused to comply with the standards of service.

The Neshonoc Light and Power Company has been ordered to make extensive changes in its hydroelectric plant and transmission system in accordance with plans suggested by the engineers of the Commission. It was found to be impossible to render service in compliance with the standards of service with the present plant and equipment.

The Mt. Horeb Electric Light Company has been authorized to abandon its present schedule for electric lighting and power and to substitute schedules prescribed by the Commission. The present rates do not yield sufficient revenue to take care of interest and depreciation charges. Furthermore, the company plans to enlarge its equipment and to furnish day service. The rates authorized by the Commission are not as high as were petitioned for nor as high as the cost of service would warrant for, in the opinion of the Commission, the business of the utility can be developed to better advantage through a reasonable schedule of rates. The present rate is 12 cents net per kilowatt-hour. The rates prescribed are as follows: primary rate, 14 cents net for kilowatt, for the first 30 hours' use per month of the active connected load; secondary rate, 12 cents net for the next 60 hours' use of the active connected load; excess rate, 9 cents net. In class A, consisting of residences, etc., 60 per cent of the first 500 watts connected and 33.3 per cent of the remainder is to be considered active. In class B, consisting of stores, offices, banks, saloons, etc., 70 per cent of the first 2.5 kilowatts and 55 per cent of the balance is to be considered active. In class C, consisting of churches, industrial establishments, club rooms, hotels, schools, etc., 55 per cent of the connected load is to be active.

The rate for power service consists of a service charge of 75 cents net per month per horsepower and an energy charge of 5 cents net for the first 50 hours' use per month of the connected load and an excess rate of 3 cents net per kilowatt-hour.

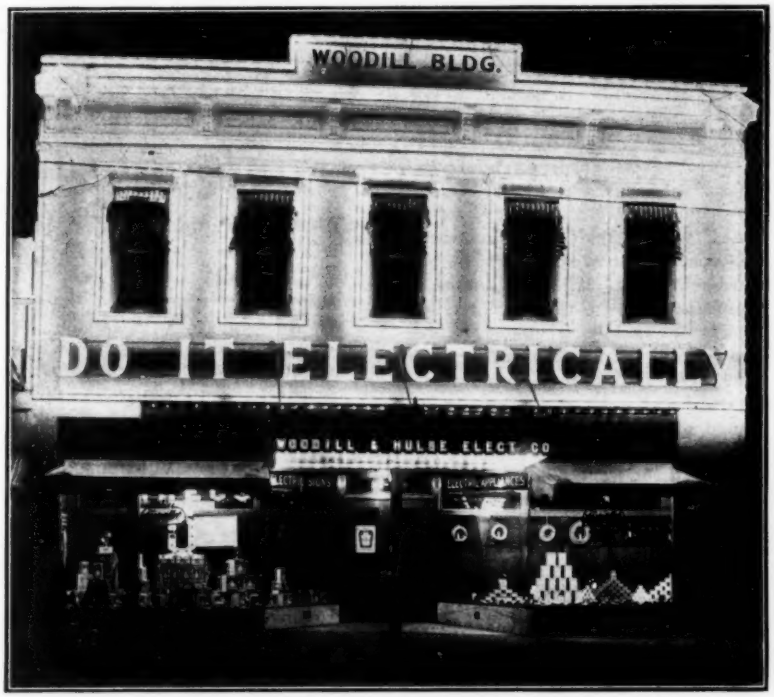
Among the Supply Men

The Walsh Electrical Supply Company, Incorporated, New York, N. Y., has been organized as a corporation to carry on a general jobbing business in electrical supplies. The company will have no retail store and will cater to the electrical contracting trade and the general and building contracting business only. The business will be conducted by John F. Walsh, at present president and manager of the Alpha Electrical Supply Company of New York City. The officers of the company are: John F. Walsh, president and treasurer; James G. Walsh, vice-president; Chester N. Rogers, secretary. The warehouse of the company will be established at 129 and 131 West Thirty-fifty Street.

The Electric Appliance Company, of New Orleans, held its annual meeting and banquet on January 24. The dinner program was ornamented with illustrations of the various buildings occupied in turn by the business of C. Robert Churchill and later the Electric Appliance Company. From these illustrations it appears that in 1898 the place of business and stock in trade was a rather neat looking black felt hat. In 1900 there was a warehouse in Dosiere Street, and in 1903 this became enlarged. In 1905 the Electric Appliance Company was established at 139 and 141 Chartres Street, in 1907 the building at 205 to 209 Chartres Street being established. In 1914 the new building at 408 to 416 Canal Street was occupied.

A Progressive Electrical Supply Store.

One of the progressive electrical supply houses of the country is the Woodill & Hulse Electric Company, of Los Angeles, Cal. Although just recovering from a fire which practically cleaned up the entire stock, the company is making a handsome display in its new store which is equipped with a complete line of electrical supplies. The company is a member of the Society for Electrical Development, Incorporated, and it is believed to be the first dealer in the United States to advertise the slogan "Do It Electrically." The illustration herewith shows how this slogan stands out



Store of Woodill & Hulse Electric Company.

Lighting of a Mail-Order Mercantile Establishment.

The February meeting of the Chicago Section, Illuminating Engineering Society, was held on the evening of February 11th at the Chicago headquarters of Sears-Roebuck & Company. This is the largest mail-order house in the world, employing about 10,000 persons in Chicago alone.

The company gave a dinner to the visitors, who numbered about 100. S. E. Church, electrical engineer of the company, made a brief address outlining the program of the evening. Mr. Church then led the party through various departments and offices of the main merchandise building, several large offices in the administration building, the press room and composing room of the printing building, and the boiler, engine and refrigerating room in the power house. A special fire drill by the private fire department of the company was witnessed. At a number of points the party paused to make a detailed study of the illumination. Mr. Church presented data on the equipment.

In a typical office section in the merchandise building the bays are 16 by 14 feet in area and the ceiling 11 feet 7 inches high. Direct general lighting is employed; desk lamps for local lighting are used in but very few cases. The illumination is provided by four 60-watt bowl-frosted tungsten lamps, evenly spaced, per bay; each lamp is equipped with a Holoplane-D'Olier enameled steel reflector, the lower edge of which is 8 feet, 11 inches above the floor. With only one bay lighted the average illumination on the working plane was 1.57-foot candles. With the whole room lighted this average illumination was 3.63 foot-candles. The maximum variation from the average was 11 per cent. A test of depreciation from two months' accumulation of dust on the lamps and reflectors showed a falling off of 23.2 per cent in the illumination. Open wiring is used with eight 60-watt lamps per circuit. The circuits are arranged parallel to the window; the lamps on the middle circuits of the wide room are on nearly all day; as it becomes darker one after another circuit is turned on until the windows are reached on either side of the room at dusk.

In one of the large offices (the order-entry department) of the administration building indirect lighting is used. The bays are 20 feet square and the ceiling height 14 feet 6 inches; the upper edge of the reflector is two feet from the ceiling. Four 100-watt clear tungsten lamps are used with X-Ray silvered glass reflectors. Each unit is hung directly on the cord without chain or stem suspension. Originally the walls and ceiling had a dark color and the illumination on the working plane averaged 1.32 foot-candles with only one bay lighted. On repainting walls and ceiling with a light cream color the illumination in one bay was raised about 50 per cent to 2.09 foot-candles. With the entire room lighted the average illumination values were 1.5 and 2.5 foot-candles before and after repainting. The illumination was exceptionally uniform. Depreciation from two months' accumulation of dust on the reflectors and lamps was about 22.5 per cent. No local lighting whatever is provided in these offices. The average cost of cleaning each fixture in the entire plant, both direct and indirect fixtures, is two cents for each cleaning; two months is the longest interval between cleanings.

In the large press room in the printing building the bays are 16 feet square and lighted with three 100-watt tungsten lamps in enameled steel reflectors intended for 150-watt lamps so as to almost hide the lamps from view. The reflectors are 13 feet 10 inches from the floor. The average illumination is 2.71 foot-candles. In the composing room prismatic glass reflector units provide the general illumination and local lighting is used for the composing racks and make-up stones.

The total number of lighting outlets in the establishment is about 31,000. There are in use about 20,000 carbon, 7,000 tungsten, and 3,000 Nernst lamps.

Automatic Telephones in England.

The Postmaster-General of England, after satisfactory trials, has decided to use automatic telephones for the public service, and not only London, but various towns in the North, will be served with as little delay as possible. In Manchester and the surrounding district many underground cables are being laid for the purpose, and an automatic exchange is to be installed at Stockport.

High-Speed Telegraphy.

The Creed automatic system of high-speed telegraphy has been adopted between the London and Edinburgh offices of the *Scotsman*, and it is stated that the three wires previously necessary have now been superseded by one wire.

CALCULATION OF WIRE SIZES FOR MULTIPLE-UNIT POST STREET LIGHTING SYSTEMS.

By Arthur L. Abbott.

A somewhat interesting application of Ohm's law, and one which is a little puzzling until it is given some attention, arises in calculating the drop on unbalanced three-wire circuits as almost universally used in operating ornamental-post street-lighting systems.

In a typical installation, the posts have five lamps, one top lamp consuming 100 watts, and four lower lamps consuming 60 watts each. The posts are operated on a three-wire multiple system, using 110-volt lamps, the four lower lamps being connected to one side of the system, and the one top lamp being connected to the other side. Switches are connected as shown in the diagram, Fig. 1, so that all lamps may be burned from dark to midnight, and then the lower lamps can be switched off, leaving the top lamps to burn till daylight. The distance being given from feed-point to first post, or between two posts, and the number of posts, size of lamps, and percentage drop being specified, it is required to find the size of each of the three wires. It is of course required that the drop on the two sides of the three-wire system shall be as nearly equal as possible, using standard commercial sizes of wire, also that operation shall be satisfactory after midnight when the lower lamps are switched off.

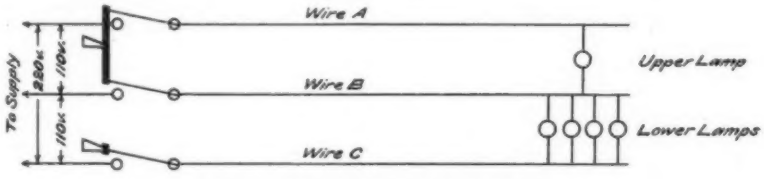


Fig. 1.—Wiring Diagram for Switches.

There are, in general, two arrangements which should be considered.

Case I.—B and C may be the same size, with A a smaller size.

Case II.—A and B may be the same size, with C a larger size.

There are, of course, other possible arrangements, but none which are of any practical importance.

Case I.

Let I = amperes in wire A
I' = amperes in wire C
M = circular mils of wire A
M' = circular mils of wires B and C
$K = 10.8 \times D$ (10.8 being taken as the resistance in ohms of a mil-foot of copper, and D being the length of one wire.)

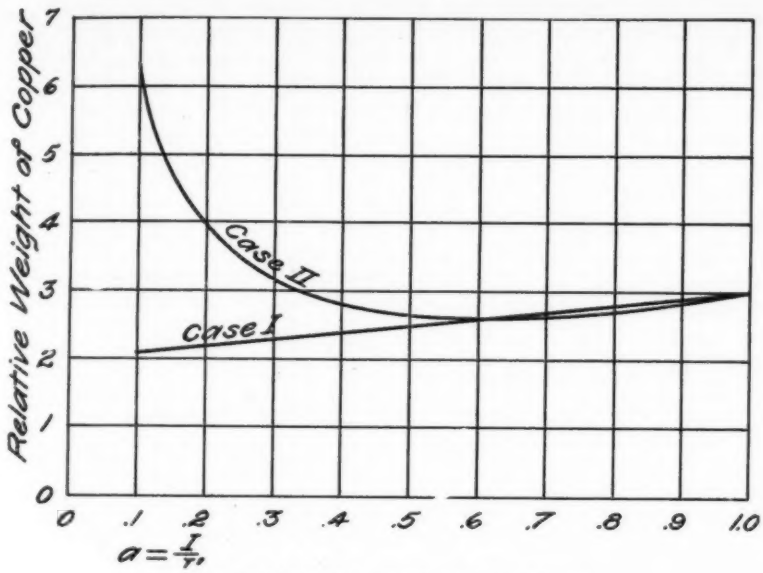


Fig. 2.—Relative Values of Total Area of Wires.

Then drop in wire $A = IK/M$
drop in wire $B = (I' - I)\,K/M'$
drop in wire $C = I'\,K/M'$

Total drop for lower lamps = drop in B + drop in C = $(2\,I' - I)\,K/M'$.

To find the size of wire A, the condition is given that the drop for the lower lamps shall equal the drop for the top lamps. Since the drop in the neutral wire B affects the upper and lower lamps equally, it is plain that to fulfill the condition stated, the drop in wire A must be equal to the drop in wire C, or

$$IK/M = I'K/M'$$

Whence $M = M'\,I/I'$

When the lower lamps are switched off, we have

Total drop = drop in wire A + drop in wire B = $I\,K/M + I\,K/M' = (M' + M)\,I\,K/M\,M'$

Case II.

Let N = circular mils of wires A and B
N' = circular mils of wire C

Then drop in A = $I\,K/N$
Drop in B = $(I' - I)\,K/N$
Drop in C = $I'\,K/N'$
Total drop for top lamps = $I\,K/N + (I' - I)\,K/N = I'\,K/N$

The value of N in terms of N' is found by equating the drop in A and the drop in C.

$$I\,K/N = I'\,K/N'$$

Whence $N = N'\,I/I'$

When the lower lamps are switched off, we have

Total drop = $2\,I\,K/N$

The drop being the same in both cases, we wish to determine which arrangement is the more economical of copper. Equating the expressions for the total drop in the two cases with all lights burning,

$$(2\,I' - I)\,K/M' = I'\,K/N,$$
$$N = M'\,I'/(2\,I' - I)$$

If I is less than I' in the ratio $I/I' = a$,

$$M = M'\,a$$
$$N = M'/(2 - a)$$

In case I we have

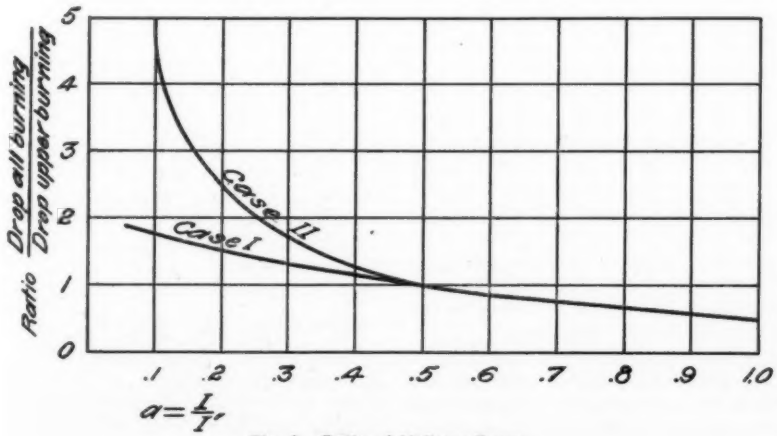


Fig. 3.—Ratio of Voltage Drops.

One wire of area M circular mils = $M'\,a$ circular mils
Two wires of area M' circular mils.
Total area of the three wires = $(a + 2)\,M'$

In case II we have
Two wires of area = N circular mils
One wire of area N' circular mils = N/a circular mils
Total area of the three wires = $2\,N + N/a = (2a + 1)\,N/a = M'\,(2a + 1)/(2a - a^2)$

Relative values of total area of the three wires for varying values of a are shown for both cases by the curves in Fig. 2. Values of the ratio of drop with all lamps burning, to drop with top lamps only burning, are shown for the two cases by the curves in Fig. 3. From a consideration of Fig. 2 and Fig. 3 it is evident that in most actual cases, neither of the two arrangements has much advantage over the other. Where there is any choice, Case I has somewhat the best of the argument.

It is desirable to figure the size of wire required for a specified percentage drop by the use of a standard table giving percentage drop for all sizes of wire and all common voltages, for various values of "ampere-feet," the quantity "ampere-feet" being the amperes in the circuit multiplied by the single distance in feet.

In Case I, the drop = $(2\,I' - I)K/M'$ = $(2/a - 1)\;10.8 \times D\;I/M'$

The standard table referred to is calculated from the formula

$$\text{Drop} = \frac{I \times 10.8 \times 2\,D}{\text{Circular mils}}$$

The expression for the drop in Case I may be reduced to the similar form Drop = $1/2\,(2/a - 1)\,I \times 10.8 \times 2\,D/M'$ = $(1/a - 1/2)\,I \times 10.8 \times 2\,D/M'$

Hence, if we find the ampere-feet for the top lamps, and multiply this quantity by the constant $(1/a - 1/2)$, we have a quantity which may be called the "equivalent ampere-feet" and which may be used with the table for finding the size of wire C. The value of M' (the size of wire C) being determined, the value of M (size of wires A and B) is given by the formula

$$M = M'\,a.$$

Values of I, I', a, and the constant $(1/a - 1/2)$ by which the ampere-feet $I\,D$ must be multiplied in order to obtain the "equivalent ampere-feet" for use with a table, are given in Table I for all ordinary combinations found on five-light posts.

TABLE I.

Top Lamp Watts.	Four Lower Lamps Watts each.	I per post.	I' per post.	a.	$\frac{1}{a} - \frac{1}{2}$
150	100	1.36	3.64	0.38	2.17
150	60	1.36	2.18	0.63	1.10
100	60	0.91	2.18	0.42	1.90
60	60	0.545	2.18	0.25	3.50
60	40	0.545	1.46	0.37	2.17

ACCURACY OF THE FORMULAS FOR THE RATIO, REGULATION, AND PHASE ANGLE OF TRANSFORMERS.

By P. G. Agnew and F. B. Silsbee.

There has been a great deal of discussion of the formulas for the predetermination of the performance of transformers from the constants obtained from the "short-circuit" and "open-circuit" tests, particularly in regard to the formula for computing regulation. We have very little data available, however, which will enable one to compare the formulas with accurately observed values. Bedell[1] and Drysdale[2] have published results for some of the formulas, which show a very fair agreement but so far as the authors are aware no comparisons have hitherto been published based on the precise potentiometer methods now available for the direct determination of ratio, regulation, and phase angle.

Only a summary of the formulas is given here, but a complete discussion showing the magnitude of all the approximations involved in their derivation has been published elsewhere.[3]

If n=ratio of turns, primary to secondary.

E_1, E_2=primary and reversed secondary terminal voltages.

R_1, X_1, Z_1=primary resistance, reactance and impedance.

R_2, X_2, Z_2=secondary resistance, reactance and impedance.

R, X, Z=total resistance, reactance and impedance, referred to the primary, so that

$R=R_1+n^2R_2$, $X=X_1+n^2X_2$, $Z=Z_1+n^2Z_2$.

$I=I_2/n$=load current referred to primary side.

Θ=angle by which I lags behind E_2.

I_0=exciting current.

φ=magnetic flux.

γ=angle by which the exciting current lags behind the induced voltage.

Then in Fig. 1 the vector difference between E_1 and nE_2 is made up of four parts, IR and IX in phase and in quadrature, respectively, with I, and I_0R_1 and I_0X_1 in phase and in quadrature, respectively, with I_0.

Then the formulas are:

$$\text{Ratio} = n\left[1+\frac{IR\cos\theta \pm IX\sin\theta}{nE_2}+\frac{(IR\sin\theta \mp IX\cos\theta)^2}{2n^2E_2^2}+\frac{I_0R_1\cos\gamma+I_0X_1\sin\gamma}{nE_2}\right]$$

$$\text{Ratio}_{(\text{Power-factor}=1)} = n\left[1+\frac{IR}{nE_2}+\frac{I^2X^2}{2n^2E_2^2}+\frac{I_0R_1\cos\gamma+I_0X_1\sin\gamma}{nE_2}\right]$$

$$\text{Ratio}_{(\text{no load})} = n\left[1+\frac{I_0R_1\cos\gamma+I_0X_1\sin\gamma}{nE_2}\right]$$

$$\text{Per cent regulation} = 100\left[\frac{IR\cos\theta \pm IX\sin\theta}{nE_2}+\frac{(IR\sin\theta \mp IX\cos\theta)^2}{2n^2E_2^2}\right]$$

$$\text{Per cent regulation}_{(\text{Power-factor}=1)} = 100\left[\frac{IR}{nE_2}+\frac{I^2X^2}{2n^2E_2^2}\right]$$

$$\text{Phase angle} = \frac{1}{E_1}[IR\sin\theta - IX\cos\theta + I_0R_1\sin\gamma - I_0X_1\cos\gamma]$$

$$\text{Phase angle}_{(\text{Power-factor}=1)} = \frac{1}{E_1}[-IX + I_0R_1\sin\gamma - I_0X_1\cos\gamma]$$

$$\text{Phase angle}_{(\text{no load})} = \frac{1}{E_1}[I_0R_1\sin\gamma - I_0X_1\cos\gamma]$$

(The last three equations give the phase angle in radians. To get minutes, multiply by 3438.)

When the phase angle is + the reversed secondary voltage leads the primary voltage. When $\pm$ signs occur the upper sign should be used for lagging, and the lower sign for leading current.

Since the primary and secondary reactance cannot be directly determined separately, one may assume that the reactance drop is equally divided between primary and secondary, so that

$$X_0 = X/2$$

For most practical work the square terms in the formulas for ratio and regulation may well be omitted.

Discussion of Formulas.

The combined approximations made in the deduction of these formulas are less than 0.01 per cent in ratio and regulation, or 0.4 minute in phase angle in a transformer having an impedance drop of 2.5 per cent of rated voltage and a magnetizing current of 6 per cent of rated current. For smaller impedance drop and magnetizing current the magnitudes of the approximations are still less. In nearly all practical cases the inaccuracy of the temperature measurements alone is sufficient to cause an error as great as the combined approximations, to say nothing of instrumental errors and the assumption that the reactance under working conditions is the same as that under short-circuit conditions.

In fact in most cases it is meaningless to compute regulation to 0.01 per cent since the accuracy of the experimental data does not warrant it.

It is evident from the form of the equations that when plotted against current at a given power-factor and voltage the phase angle of a transformer gives a straight line. The ratio and regulation give nearly a straight line, the very slight curvature being due to the square term. With constant secondary current, the phase angle gives a sine curve when plotted against the phase angle of the connected load, crossing the axis of zero phase near the point where $\Theta = \tan^{-1}X/R$. Similarly, the ratio and regulation give nearly sine curves (distorted by the square term) which have their maxima where $\Theta = \tan^{-1}X/R$. These relations may be found useful even when the short-circuit data are not available.

As they now stand the Standardization Rules of the American Institute of Electrical Engineers are not definite in regard to the exact definitions of rated current and rated voltage when the voltage drop within the windings is taken into consideration. However, this has been brought to the attention of the Standards Committee and will be corrected.

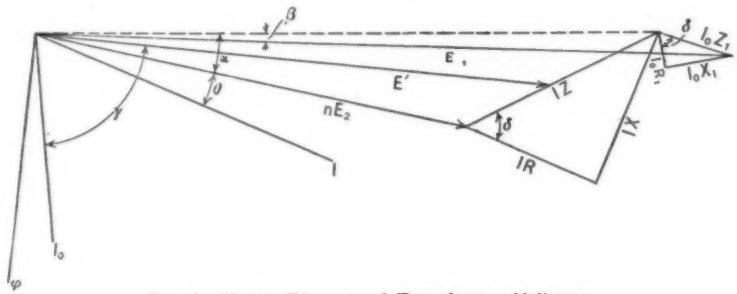


Fig. 1.—Vector Diagram of Transformer Voltages.

Numerical Example.

Consider a 2-kilowatt, 1000/100-volt, 60-cycle transformer. Let $R_1=6$, $R_2=0.065$, $X=15$, $I_0=0.12$, $\cos\gamma=0.4$, $n=10$, $I=2$, $R=R_1+n^2R_2=12.5$, $X_1=X/2=7.5$.

The no-load ratio is

$$10\left[1+\frac{0.12\,(6\times0.4+7.5\times0.92)}{1000}\right]=10.011$$

The per-cent regulation at 0.6 power-factor, lagging current, is:

$$100\left[\frac{2\times12.5\times0.6+15\times2\times0.8}{1000}+\frac{(2\times12.5\times0.8-15\times2\times0.6)^2}{2\times100\times10000}\right]$$

$$=3.90 \text{ per cent.}$$

and the phase angle is

$(2\times12.5\times0.8-2\times12.5\times0.6)/1000 + 0.12\,(6\times0.92-7.5\times0.4)/1000 = +0.0023$ radian $= +8'$.

The positive sign indicating that the reversed secondary voltage leads the primary voltage.

Experimental Tests of the Formulas.

As a test of the formulas accurate measurements were made of ratio and phase angle of two different types of lighting transformers by the potentio-

1 Bedell, Chandler and Sherwood: *Electrical World*, 30, p. 190; August 14, 1897.
2 Drysdale: *Electrician*, 65, p. 643; July, 1910.
3 *Bulletin of the Bureau of Standards*. 10, p. 279, Reprint No. 211.

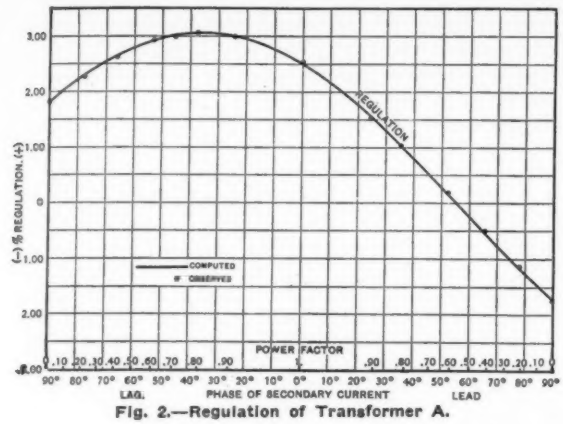


Fig. 2.—Regulation of Transformer A.

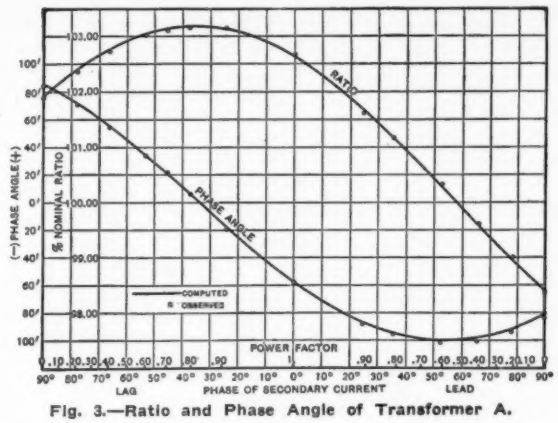


Fig. 3.—Ratio and Phase Angle of Transformer A.

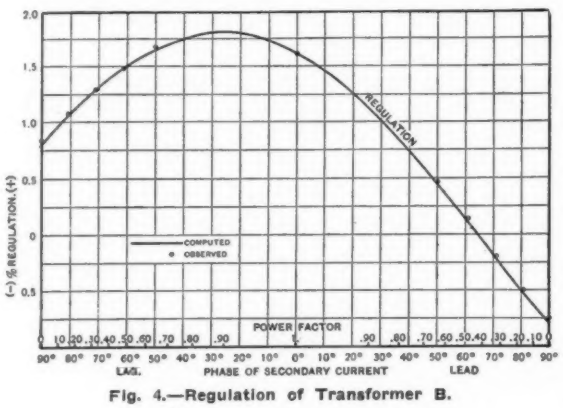


Fig. 4.—Regulation of Transformer B.

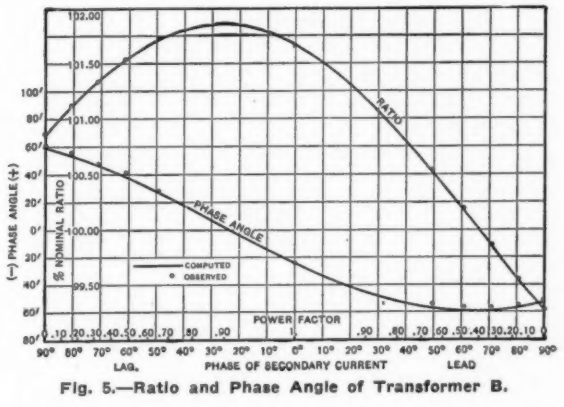


Fig. 5.—Ratio and Phase Angle of Transformer B.

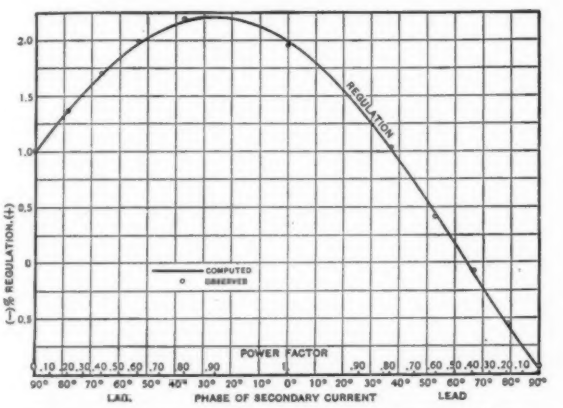


Fig. 6.—Regulation of Transformer B at Excess Voltage.

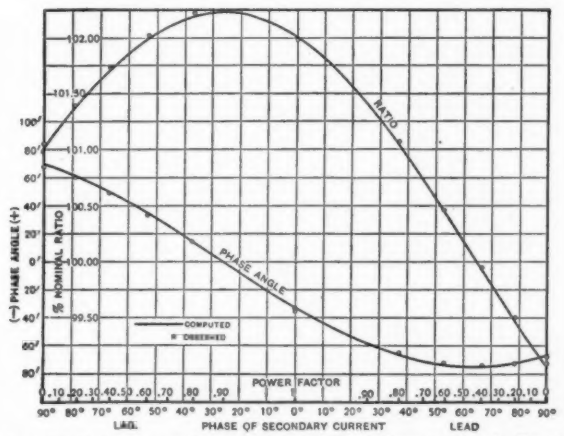


Fig. 7.—Ratio and Phase Angle of Transformer B at Excess Voltage.

meter method[4] and covering the whole range of power-factors from zero power-factor, current leading, to zero power-factor, current lagging.

DATA ON TRANSFORMERS

	Transformer A	Transformer B
Rated kilowatts	0.6	5.0
Frequency	60.0	60.0
Voltage	240/120	1,100/110
Method of cooling	Air only	Oil.
Resistance drop—per cent	2.3	2.0
Reactance drop—per cent	1.6	1.0
Impedance drop—per cent	2.8	2.2
Exciting current at rated voltage—per cent	11.0	3.4
Power-factor of exciting current at rated voltage—per cent	0.39	0.23
Increase of voltage to give 11 per cent exciting current—per cent		23.0
Power-factor at 11 per cent exciting current		0.09

4 For a description of this method, see Agnew and Silsbee, *Proceedings American Institute of Electrical Engineers*, 31, p. 1,267; June, 1912.

These phase relations were obtained by opposing two similar transformers as in the usual connections for a heat run. The electromotive force which was inserted to circulate the load current was derived from the secondary of a phase-shifting transformer excited from a second generator on the same shaft as that which excited the transformer under test. The magnitude of the current could be controlled by the generator field and its phase adjusted independently by the position of the rotor of the phase-shifting transformer. The temperature was maintained very nearly constant during the measurements, and the results have been corrected for the slight variations which did occur. As the transformers were

small, it was necessary to correct for losses in the measuring instruments employed.

The impedances were determined by the usual short-circuit test, using carefully calibrated portable instruments. In both transformers the resistance was found to be the same on alternating current as on direct current and the leakage reactance appeared independent of the current up to twice rated current.

Figs. 2 to 5 have been plotted to show the results of the comparison. Ratio, regulation, and phase angle are plotted against the angle between secondary current and voltage. (Power-factors have also been indicated on the axis of abscissas.) The full lines are computed by the formulas from the short-circuit data, while the circles represent observed points. It will be seen that the agreement is quite satisfactory. In the runs plotted in Fig. 6 and 7 the voltage on transformer B was arbitrarily raised to give an exciting current of 11 per cent of rated load current, so as to magnify the effect of the approximations made in the derivation of the formulas. The agreement between computed and observed values is entirely satisfactory, again showing that the effect of the exciting current upon the regulation is inappreciable.[5] The current rating was taken as unchanged and hence the regulation is proportionately less than at rated voltage.

It is evident, at least for the two types of transformers represented in these tests, that the short-circuit test gives results which are entirely adequate for the predetermination of the operating characteristics, the accuracy being limited by the errors of measurement and not by theoretical errors.

Railroad Yard Lighting.

On Friday evening, February 13, A. C. Cotton and H. Kirschberg presented a paper on "Railroad Track Scale and Yard Lighting" before the Pittsburgh Section of the Illuminating Engineering Society. Preliminary to this paper, J. L. Minick outlined the general conditions to be met in this class of work. On account of the value of the land it is usually undesirable to allow sufficient clearance between tracks for pole lines. Consequently, lighting a yard presents the same general requirements as would lighting a city of long, narrow streets, with high buildings on both sides.

The paper on "Yard Lighting" was read by Mr. Kirschberg, and was devoted largely to outlining the conditions to be met by the illuminating engineer. Freight is collected at various points along the main line and branches, by what are known as collection freights, and conveyed to receiving yards, situated at convenient points on the division. Immediately adjacent is the classification yard, with the track scales between. The train of cars is pushed from the receiving yard to the hump, where each car is cut from the train and allowed to float by gravity, down a two-per-cent grade to and over the scale, thence down a 1.4-per-cent clearance grade to the classification yard to be made up into trains. As the car passes over the scale at a speed of about 2.5 miles per hour, the weighing is done, the number and weight (empty) of the car is read from the side or either end, and a record made, the entire operation taking from eight to twelve seconds.

Of the many special problems of illumination presented on a railroad, none, perhaps, is of more importance or is capable of more solutions than that of track-scale lighting. A modern track scale is from 37 to 83 feet in length and of 300,000 pounds capacity and is used to weigh all freight passing over the road, a large percentage of the weighing being done at night. Inasmuch as better light around the scales permits a better movement of cars through the yards, thereby increasing their capacity, it is evident that the successful solution of this problem is greatly to be desired. The conditions to be met are:

(1) Sufficient illumination in the scale house, with special attention to the scale beam, to permit rapid and accurate weighing. The lamps must be so placed and shielded that none is in the field of vision, either from the inside or outside of the scale house, and that no reflection of the lamps is seen in the windows, making it difficult to see the numbers on the cars outside.

(2) Sufficient illumination outside the scale house to enable those inside and those outside to perform the following duties: safe cutting of cars at the hump; seeing location of car at every point in its movement; clear sight of every wheel onto the scale; reading light weights and numbers on ends of approaching cars; reading same on side of car while on scale (for this, a clearance of 2 feet, 11.5 inches is all that is allowed); reading of same on receding end of car if not previously secured; clear sight of movement of wheels off the scale; clear sight of movement of car down the clearance grade, in order to safely pass the next car over the scale; location of position of car on the clearance grade in order not to bump cars too hard when making up drafts of cars to go down the classification yard.

It is evident that the weighmaster must look from a well lighted room, through glass, into an illuminated open space with a dark background; also that the riders in charge of the cars are continually moving from a well lighted zone into one with a very low intensity of illumination. Glare in such cases is productive of danger to individuals and possible damage to equipment.

Considering all the conditions to be met, an attempt to adequately light the scale and its surroundings inexpensively and efficiently requires not only a thorough knowledge of illuminants and their particular qualities, but also a fair amount of ingenuity in their use to obtain the best results. With so many variations in surroundings, a standard scheme is well nigh impossible.

The trackage layout in the yards should provide space for poles on which to mount lamps, but the space allotted to the lighting is not only often insufficient, but is also poorly located. The usual lighting scheme employs a line of arcs down the center of the yard, and a line on each side. Other methods have been used, with as poor results. Many engineers, in designing this class of lighting, have considered the yard as an open space and have lighted it accordingly. Quite contrary to this idea, the problem of yard lighting may be stated to be more involved than any problem of street or park lighting. A classification yard consists of a series of streets, three to four feet wide, with buildings about 14 feet high on both sides. The ideal system would provide light on and between every pair of tracks.

The conditions to be satisfied may be briefly stated as follows: (1) illumination of the grade leading from the scale to the yard; (2) illumination of the switches at the head of the yard, to facilitate control of car movement from the switch tower; (3) illumination of every track, irrespective of position of adjacent cars; (4) illumination of every car in the yard; (5) absence of glare from every position in the yard. The foregoing must be accomplished without the retention of too much space from trackage, this space usually being allotted in advance without regard to its adaptability for the purpose intended.

In the discussion, which was participated in by Messrs. Mundo, Minick, Cotton, Roosa, Riker, Travers, Meeker and Kirschberg, the following points were brought out.

The railway illuminating engineer has to meet all the problems which are common to other installations and many which are not met with elsewhere. For scale lighting the flaming arc is being superseded by 250-watt tungsten lamps with suitable reflectors, in some cases being replaced lamp for lamp and in other cases six tungsten lamps replacing four flame arcs. The principal advantage of the tungsten lamp is its reliability, freedom from flickering and ready replacement by unskilled persons. A large number of small lamps would be ideal for yard lighting, but the expense would be great, and catenary construction would be required.

5 For further experimental evidence on this point see Lloyd and Agnew, Bureau of Standards, 6, p. 273.

Meter Bills in Massachusetts.

Hearings were held February 13 by the Committee on Public Lighting of the Massachusetts Legislature, on bills to compel all electric, gas and water companies to issue duplicate readings of meters to their customers, and on a bill which aims to reduce the legal maximum charge for the use of electric meters from $9 to $5 per year. Petitions for the first bill urged that buyers of any commodity have a right to know, at the time the charge is made, just the amount of the obligation. It was suggested that the meter readers' books should have duplicate leaves for each customer's monthly reading, one of which would be left with the customer. It was stated that some companies send bills two or three weeks after the reading of the meters, too late for a satisfactory adjustment of errors.

Attorneys for the lighting companies brought out the fact that the law requires gas companies to give a duplicate of gas meter readings on the customer's request. The main objection, from the companies' standpoint, to the giving of duplicates to all consumers was the cost. The requests for duplicate readings of gas meters are few.

Everett W. Burdett, representing the electric companies, stated that the Boston Edison Company has for eight years made it a rule to give duplicate readings of meters on request. The company has 60,000 meters on its services, but there are only about 200 patrons who request duplicate readings. The company issues a card describing how to read meters and urging customers to compare their own readings with the bills. No objection was offered to the extension of the law relating to gas meters to include electric meters.

Joseph W. Cowles, meter expert for the Boston Edison Company, stated that the meter readers' record card bears the words "Leave Readings" in rubber stamp in cases where duplicates are wanted.

Warren D. King, of the Peabody municipal plant, stated that of 1,300 customers he had requests for only two duplicates. The management sends postcards to customers not found at home showing dials of the meter, with the request that these patrons indicate the position of the hands and send the postcards to the office. These readings are checked up from subsequent readings by the plant's employees.

On the bill to reduce the meter charge to $5 per year, Mr. Burdett pointed out that last year the maximum legal charge was reduced from $12 to $9. He held that the claim that meter charges should be constantly reduced or done away with is based on a false assumption. Customers who use as little electricity as $5 worth per year are unprofitable. The meter charge is not simply for the use of the meter but the fair charge for the company's readiness to serve. The whole plant is at the command of the customer. A reduction in charges to unprofitable customers would necessarily result in placing an added burden on the larger consumers.

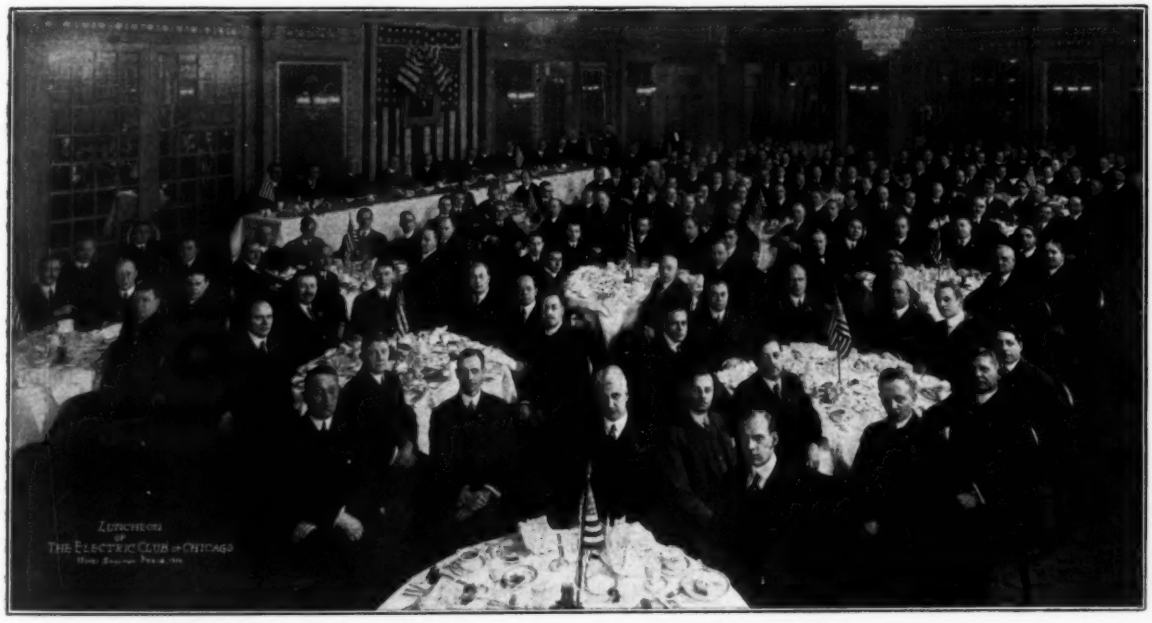
Mr. Burdett pointed out that the energy loss of the Boston Edison Company is about $2.34 per meter and that the whole cost of maintaining meters is between $7 and $8 per year each. Mr. King, of Peabody, held that the actual excitation loss in the meter amounts to $4.20 a year at a 12-cent rate. This loss is not recorded by the meter and is borne by the central station.

Chicago Electric Club.

A special luncheon in honor of Lincoln's birthday was held by the Electric Club of Chicago, on February 12. Henry Walter Grahm delivered an address on Lincoln and a musical program of patriotic airs was provided. Special decorations in honor of the occasion were provided. The attendance at this meeting was 179.

Louisville Automobile Show.

Electric vehicles were prominently displayed at the annual automobile show held in Louisville, Ky., February 11-14, and the evident popularity of cars of this type was generally commented upon. The Kentucky Wagon Manufacturing Company, of Louisville showed a full line of its electric commercial cars, while the Detroit, Waverley, Rauch & Lang, Baker, Ohio, Chicago and Woods passenger vehicles were also displayed.



Luncheon of the Electric Club of Chicago at the Hotel Sherman, Chicago, February 12, 1914.

Wiremen Oppose Government Ownership.

At a meeting of the New England District Council of the American Federation of Labor, Electrical Workers' Unions, held in Boston on February 8, a vote was passed opposing the government ownership of telephone and telegraph systems. It was the sentiment of the meeting that government ownership would be inimical to the interests of labor unions.

Kings County Electric Light Has Good Year.

The Kings County Electric Light & Power Company's report for the year ending December 31, 1913, shows that the year just past has been one of increased activity, and has been attended by satisfactory financial results. The following is a condensed statement of earnings and expenses with 1912 comparisons:

	1913.	1912.
Total revenues	$5,742,548.12	$5,245,835.31
Expenses, including taxes and depreciation charges	3,662,627.99	3,395,006.59
Gross income	$2,079,920.13	$1,850,828.72
Bond interest and other income deductions	$ 877,095.37	$ 898,944.14
Dividends, profit sharing, etc.	1,042,125.66	846,192.64
Surplus for the year	$ 160,699.10	$ 105,691.94
Stock outstanding Dec. 31	$12,942,900.00	$10,000,000.00

These results have been made possible by effecting economies in administration and operation wherever consistent with first-class service, and by rapid increase in the public use of the company's electric service.

On July 1, 1912, the retail rate for current was reduced from 12 cents per kilowatt-hour to a sliding scale demand rate, beginning at 11 cents per kilowatt-hour, and continuing at eight cents and four cents for increased hours of use. Tungsten-lamp prices were greatly reduced and sizes of 100 watts and over are supplied free to all retail customers.

Special effort has been devoted to obtaining large power business and over one hundred private plants, ranging in capacity as high as 1,000 horsepower, have been replaced by the service of the company. During the year 23,855 contracts were signed. In addition to the current supplied for lighting, 74,052 horsepower in motors are operated from the company's lines.

On March 1, $2,500,000 of six per cent12-year convertible debenture bonds were offered to the stockholders at par in proportion to their stockholdings and were fully subscribed. On the same date, the first issue of $4,000,000 similar debenture bonds became convertible into stock of the company at par, and up to the end of year $2,942,900 of these bonds were converted.

The plant and property as shown by the balance sheet has substantially increased and includes a new boiler house, substation and station apparatus.

The profit-sharing plan inaugurated in December, 1910, was continued and on January 1, 1914, $56,653.72 was distributed to 927 employees. The Brooklyn Edison Investment Fund, designed for the purpose of encouraging thrift and enabling employees to invest their savings in the securities of the company, achieved a wider usefulness, two-thirds of all employees being depositors in the fund. Three men who had served the company for over 20 years, and who, owing to age and physical disability were unable to perform further duty, were pensioned. In addition to the foregoing, a number of opportunities for physical and mental development were offered employees.

The company also reports a growing cordiality in relationship between its customers and its employees, and notes that despite the high cost of living and increase in cost of labor, materials and commodities generally, the adoption of substantial economies and increased efficiency have made possible continued first-class service at low rates with a continuance of the high standard of wages to employees. Indications are that the current year will compare favorably with 1913.

Cleveland Electrical Exposition.

Cleveland, O., is planning a great electrical exposition to be held May 20 to 30 in the Coliseum. The project is to be given under the auspices of the Electrical League of Cleveland, whose committees have been so active during the first month of preparation that success is already assured.

Cleveland claims to lead the nation in many departments of the electrical trade. It is the headquarters for the greatest lamp works, the home of the biggest carbon manufacturing plant, and it boasts of three leading manufacturers of electric vehicles. It holds highest rank in the manufacture of electric cranes and hoisting machinery and is a leader in the making of batteries.

For its decorating and lighting scheme the committee has the services of a corps of leading electrical engineers. This is to be the first electrical exposition ever held in Cleveland, and the city is planning to give it in the same manner that characterized its Industrial Exposition.

Among the companies that have already notified the committee that they will exhibit are the following:

The A. & W. Electric Sign Company, The Adams-Bagnall Company, Adapti Manufacturing Company. The Walter P. Ambos Company, American Steel & Wire Company, The Atlas Car & Manufacturing Company, Bailey Reflector Company, The Brookins Company, Case School of Applied Science, Chicago Pneumatic Tool Company, Cleveland Armature Works, Cleveland Crane & Engineering Company, The Cleveland Electric Illuminating Company, Cleveland Electric Machine & Manufacturing Company, The Cleveland Switchboard Company, The Cleveland Telephone Company, Electric Controller & Manufacturing Company, Electric Products Company, Electric Storage Battery Company, The Electric Welding Products Company, Electrical Contractors Association, Electrical Distributors Company, Enterprise Electrical Construction Company, Enterprise Electrical Fixture Company, The Erner Electric Company, Esterline Company, The Euclid Avenue Electric Fixture Company, Eureka Vacuum Cleaner Company, Franz-Premier Vacuum Cleaner Company, The P. A. Geier Company, General Electric Company, Gould Electric Storage Battery Company, Hickok Electrical Instrument Company, Holophane Works of General Electric Company, R. C. Hull Electric Company, H. W. Johns-Manville Company, The Kinney & Levan Company, Leece-Neville Company, Leonard-Bundy Electric Company, Mead Electric Signal Company, Multi-Lux Illuminating Company, National Carbon Company, National Electric Lamp Works, The Nungesser Carbon & Battery Company, The Price Electric Company. The Rauch & Lang Carriage Company, The Republic Electric Company, John A. Roebling's Sons Company, Salzer Electric Company, The Sterling & Welch Company, The Strong - Carlisle - Hammond Company, The Tuec Company, The Van Dorn Electric Tool Company, Western Electric Company, Westinghouse Electric & Manufacturing Company, The Willard Storage Battery Company, The George Worthington Company.

Chicago Vehicle Men to Hold Bowling Contest.

A special committee of the Chicago Section, Electrical Vehicle Association of America, which has been working on plans for a social gathering for members and their friends, reported at the regular meeting on February 17. Tuesday, March 3, has been selected as the date for the function which will take the form of a bowling contest. Schiller's billiard and bowling alleys at 318 East Thirty-first Street. have been engaged for the evening and arrangements have been made to serve a special dinner in the restaurant adjoining, at 6:30 p. m.

Tickets at $2.00 each, which include meal and privilege of the pool tables or bowling alleys, can be secured from E. J. Kilborn, 2241 S. Wabash Avenue. Chicago.

Missouri Association Meeting.

The next annual convention of the Missouri Electric, Gas, Street Railway & Waterworks Association will be held on board the steamer *Quincy* en route from St. Louis to Keokuk, Iowa, and return on May 21, 22 and 23.

Instructions for Substation Operators.

Last year, while connected with the Galveston-Houston Electric Railway Company, John G. Montgomery wrote a set of "Instructions for Operators" for the substation and switchboard operators of the company. These instructions are not intended to be elaborate and the main consideration was that the operator should be able to understand them. As they may be found useful to others, they are reproduced, substantially in full, below.

The Machine, Its Care and Management.

Before Starting.—See that the machine is in good order, and that none of the parts have been damaged or changed.

Adjust the brushes if necessary.

Inspect the oil glasses, to see if there is enough oil in the bearings.

Inspect the field-magnet circuit for loose or broken wires and to see if connected correctly.

Remove all stray keys, bolts, nails, etc., out of the neighborhood of the machine.

Starting Direct-Current Method.—Arrange the controlling apparatus on the alternating-current switchboard, according to the following: Set exciter "load" rheostat to the normal operating position; close alternating-current motor-field switch; insert alternating-current voltmeter plug in the receptacle.

Arrange the direct-current controlling switches and apparatus according to the following: Have the generator-field rheostat cut out in order to obtain a strong field. Close double-throw switch on small panelboard attached to generator to upper contacts, thereby cutting out the series field of the generator so that it can operate as a shunt motor.

After you have carried out the above instructions and you are sure that everything is all right, then proceed to close the direct-current circuit-breaker. Close the direct-current starting switch to the first contact, then wait until the machine does not appear to be gaining speed, then advance one more contact, and so on until the last contact; then close the direct-current main or positive switch, and open starting switch clear of all contacts.

Synchronizing.—The object of synchronizing is the regulation of one alternating-current machine to be connected in parallel with another alternating-current machine, so that they shall be identical and simultaneous both in phase and voltage.

Regulate the speed of the motor-generator set and the alternating-current voltage by means of the 600-volt rheostat, and the exciter's "load" rheostat, by the indications of the synchroscope. If the synchroscope indicates FAST, this means that the machines are running too fast. Cut out more of the resistance in the 600-volt field rheostat until the pointer of synchroscope slows down to about 12 revolutions per minute or less.

If the local and power-house voltmeters indicate the same voltage, watch for a favorable chance to catch the synchroscope pointer on the point of synchronism, and as quickly as possible close alternating-current running switch.

If the voltage is not correct this can be regulated by means of the exciter "load" rheostat.

Always try to have the synchroscope pointer indicating FAST, as this will cause less interruptions to service in case you fail to get the switch in time.

Clearing the Direct-Current Switchboard.—If you were successful in synchronizing the machines, proceed to clear the generator which has been running as a motor off the line as follows: Open direct-current circuit-breaker. Open the double-throw switch on small panelboard attached to the generator.

Putting Generator on Line.—All that is now necessary is to close the direct-current circuit-breaker and the main or positive switch.

While Running.—Test the bearings to ascertain if they heat, and also notice if the oil ring which lubricates the bearings is revolving with the shaft.

Heavy Loads.—1,000 or more amperes should be considered as a heavy load, and should not be allowed to continue for more than five minutes on any one generator. A two-car train, made up of two motor cars out of (————————) and a two-car train starting up at the substation will give a load of 1,200 amperes or more. Such a load is too great for a single generator and should not be allowed to continue. *To decrease load shift the brushes forward or in the direction of rotation of the armature.*

Sparking.—Giving off sparks at the commutator of the generator's armature due to bad adjustment or bad condition of the parts, and resulting in serious injury to the machine if allowed to continue. On light loads when the generator shows signs of sparking or poor commutation wipe the commutator with a clean dry rag; a little oil on the rag will also improve the commutation. *Do not grease the commutator with an oil-soaked rag, as this will cause sparking in little time; use little oil on commutator.*

Increase of Power.—It is necessary to run two units when trains made up of two motor cars are in operation on the line. It is not necessary to run units when trains made up of one motor car and trailer are in operation on the line, unless such trains are running in sections 5 to 10 minutes apart. As the speed of the motor cars varies with the voltage and not with the output of the station, have the voltage at all times as high as possible.

A boost in the voltage from 20 to 30 volts may be obtained by shifting the brushes backward or in the direction opposite to the rotation of the armature. If the machine shows signs of sparking or bad commutation decrease the load.

Interruptions and Troubles.—In case your station is pulling a heavy load and you notice the alternating-current voltage falling to a point where the machines are liable to pull out of phase, trip the machine direct-current circuit-breaker; this will relieve the sudden load on the alternating-current generator at power house and will probably cause less interruption of service. Do not do this unless you are sure it is going to a low point. Whenever a motor-generator pulls out of phase, trip the direct-current circuit-breaker first and then the alternating-current one, if necessary.

If the high tension is out entirely, open the direct-current circuit-breaker and switch, and alternating-current switch of the motor-generator without fail. The north and south feeder breakers do not have to be tripped. If for any reason a circuit-breaker should arc across, use the Pyrene fire extinguisher to break the arc.

Rapid or Frequent Interruptions of Direct-Current Circuit-Breaking.—On days that your station is pulling heavy loads and running two machines and you have trouble with the feeder breakers coming out, set them above the maximum load, to 1,800 amperes if necessary. Never close switch first and then circuit-breaker.

Rapid or Frequent Interruptions of Oil Switches.—Telephone to the engineer at power house and tell him your troubles and you will receive the necessary advice.

Instrument Fires.—If the instrument is on a circuit protected by a fuse or switch, open the switch or remove fuse; if the instrument is afire use the fire extinguisher.

Transformer Fires.—Clear the switchboard, leaving the feeder switches closed. Pull high-tension switches. Run oil out of transformer that is afire only, not all of them. Telephone power house and inform the engineer.

Burn-outs.—If the burn-out of any instrument does not cause any other interruption, continue to run the machine until it is necessary to shut down at the proper time.

Failure of Generator to Build Up Its Voltage.—After starting the generator and finding you have no indication of voltage, inspect the following: tap voltmeter lightly to release pointer, if stuck. Look for open circuit in voltmeter wiring. See that all necessary switches are closed. Trouble may be found in some of the following circuits: Open circuit between shunt-field coils; open circuit between field rheostat and field coils.

After inspecting all of the above and finding nothing wrong, proceed as fol-

lows: Bring the motor-generator up to speed by the direct-current method of starting and you will perhaps find the generator will indicate the correct voltage.

Accidents to Watt-Hour Meters.

If an accident happens to any watt-hour meter, causing it to be inoperative and it is required of you to show the readings on the daily reports the same as if the station was not crippled by a defective meter, proceed as follows: If it is a direct-current watt-hour meter that is defective and it is required to obtain the hourly readings, multiply the alternating-current meter readings (input) by the efficiency of the motor-generator set; the product will equal approximately the direct-current meter readings or output.

The efficiency may be obtained by referring to the last meter readings previous to the accident to meter, and by applying the following formula: Efficiency equals direct-current meter reading divided by alternating-current meter reading; that is, divide output by input.

If it is an alternating-current watt-hour meter that is defective and it is required to obtain the hourly readings, *divide* the direct-current meter readings (output) by the efficiency of the motor-generator set; the quotient will equal approximately the alternating-current meter readings or input.

Checking Meter Readings.—An easy method of checking the daily meter readings and kilowatt-hours in order to know if they are correct is to calculate the efficiency by dividing the direct-current readings by the alternating-current readings. The efficiency should be approximately 80 per cent and never lower than 70 per cent.

Failure of Exciter Generator to Build Up Its Voltage.

After starting the motor-generator and finding you have no indication of amperes, inspect the following: Tap ammeter lightly to release pointer, if stuck. Look for open circuit or blown fuse in ammeter circuit. See that all the necessary switches are closed, and that the brushes are making good contact with commutator. Trouble may be found in some of the following circuits: Open circuit between shunt-field coils; open circuit between field rheostat and field coils.

After inspecting the above and finding nothing wrong, proceed to excite the shunt-field windings. Disconnect the shunt-field terminals from the binding post, on small panelboard attached to the exciter-generator, and connect them to the two ends of the wires that are to be used to carry the exciting current from the other exciter. Connect the other two ends of the wires to the positive and negative terminals of the other exciter. Leave the wires connected for about one minute, then disconnect them and connect the shunt-field terminals to the binding post on small panelboard as they were connected.

Northern White Cedar Association Committees.

One of the important features of the work of the Northern White Cedar Association (formerly the Northwestern Cedarmen's Association) are the duties performed by the various standing committees. At each annual meeting these committees report upon certain definite conditions, and, incidentally, all through the year devote a great deal of time to the special matters coming within their jurisdiction.

President J. W. Benham has appointed the following committees for 1914:

Insurance—E. L. Clark, T. M. Partridge, M. Sperry, Milwaukee, Wis.; J. C. Kolliner, Stillwater, Minn.; L. L. Hill, Minneapolis, Minn.

Legislation—L. L. Hill, C. E. Learned, Minneapolis, Minn.; T. P. Bradley, Duluth, Minn.; J. C. Kirkpatrick, Escanaba, Mich.; W. B. Earle, Hermansville, Mich.

Railroads—H. F. Partridge, L. A. Furlong, L. A. Page, Jr., Minneapolis, Minn.; Joseph Meloney, Spooner, Minn.; Wm. Patch, Menominee, Mich.

Posts and Shingles—W. C. Moss, P. H. Anderes, Minneapolis, Minn.; J. E. Gerich, Milwaukee, Wis.; H. M. Dixon, Cloquet, Minn.; W. B. Thomas, Manistique, Mich.

Poles—H. W. Reade, Escanaba, Mich.; A. T. Naugle, Chicago, Ill.; Jos. Meloney, Spooner, Minn.; E. L. Clark, T. M. Partridge, Minneapolis, Minn.

Official Inspection—H. S. Gilkey, L. A. Page, Jr., Minneapolis, Minn.; E. N. Whyte, Duluth, Minn.; M. K. Bissell, J. E. Zeluff, Escanaba, Mich.

Ties—W. B. Thomas, Manistique, Mich.; H. M. Clark, Bemidji, Minn.; T. P. Bradley, Duluth, Minn.; J. C. Kirkpatrick, Escanaba, Mich.; Ben Finch, Duluth, Minn.

Pulpwood—E. N. Whyte, Geo. W. Martin, T. P. Bradley, Duluth, Minn.; Jas Sullivan, Black Duck, Minn.; F. W. Wilhelmi, Cloquet, Minn.

San Francisco in 1915.

One hundred and ninety-one conventions, which will be attended by delegates from all parts of the world, have voted to hold their sessions in San Francisco in 1915. The organizations are varied in character and include civic, religious, social service, educational, engineering, scientific, fraternal, business, labor, commercial, agricultural, live stock and scores of other interests. Several of the leading electrical bodies have already arranged to visit the coast next year.

INTANGIBLE VALUES OF PUBLIC UTILITIES.

By Arthur Halsted.

Definite and logical methods are followed in evaluating tangible capital of public utilities, and intangible capital, such as promotion expense, franchise value, working capital, etc. Even the matter of "going value" is well settled and supposed to be taken care of in development expense and appreciation.

To eliminate ambiguity, a common definition of "going concern value" will be discussed apart from a consideration of any other intangible capital of a concern.

The initial operation of a public utility is frequently attended by a deficit. This deficit is due to the building up of an organization, and a revenue-producing business, and covers a variable period of time during which the utility, at initial rates, is unable to earn a fair rate of return upon the capital investment. This deficit represents an intangible capital investment, usually called "going cost." Weight of opinion is that going cost, franchise cost, promotion expenses, may be temporarily charged to capital account, but should be amortized when surplus earnings appear.

Going value, however, may have a different meaning from going cost. Going value, from a practical standpoint, is that bonus which a willing purchaser will give a willing seller, over and above the physical value of the plant, to secure an established and going business.

In an established commercial business going value is determined by the risk to capital involved in establishing such a business, by the present earnings and reputation, and by the prospects and prognosis of the future of the business.

In determining the going value of a public utility for rate-making, a going value due to earnings cannot exist.

The going value, due to the apparent permanency of the business and to the risk to capital involved in promoting and establishing a similar enterprise, should be considered.

Going value in this light may be defined as the unearned increment of a successful venture.

As between buyer and seller, that business which had the larger going cost might well have the lesser going value or rewards of risk.

Unearned increments of real estate value and unearned increments due to the metamorphosis of a promotion project into a self-perpetuating financial institution, may be treated as upon a parity.

Going value under this definition may be added to a public utility, being evaluated for rate-making in two ways (1) by a high allowable rate of returns on the

invested capital, or (2) by an inflation of capital value.

Because of future additions to capital under public control, in which the risk will be very much less than the initial capital risk in founding the plant, going value should not be allowed by a high rate of returns.

The rate of returns upon capital invested in the utility should then be determined by the market price demanded by capital in equally secure investments.

The going value, or unearned increment in the value of the business, if any exists, should, therefore, be allowed as an inflation of capital above the tangible investment.

From our definition, going value, then, depends upon and is determined by the risks of the initial and early investments and upon the absence of risks in future investments and earnings of the utility.

Philadelphia Vehicle Meeting.

The February meeting of the Electric Vehicle Association of America, Philadelphia Branch, was held in the rooms of The Philadelphia Electric Company on Wednesday evening, February 11. About 40 members and guests were present, among whom were Albert Jackson Marshall, the new executive, secretary from New York City, and Mr. Street, general sales manager of the Walker Electric Vehicle Company, from Chicago.

The addresses of the evening were made by Mr. Woodruff, who has charge of the delivery department of Strawbridge & Clothier, and by Mr. Hancock, who holds a similar position with the Curtis Publishing Company.

The former told how five years ago his concern started experimenting with the use of motor trucks, and now they have 39 in service, five of which are electric cars. He stated that setting aside all records for economy, it would be practically impossible for them to return to horse delivery because of the different conditions which are now met. Business has been increased and their territory of free delivery greatly enlarged. Points are now reached and business secured which would have been impossible under the former conditions. The electric cars are used exclusively for city delivery and their experience has shown that one electric car has been able to displace six horses. The electric cars each make about forty miles per day; one of them gets a midday boost and covers a little more territory. They have been able to materially reduce the cost for this class of delivery.

Mr. Hancock stated that one year ago last August, they started experimenting with electric trucks, putting one seven-ton vehicle in service. They formerly had all their trucking done by contract, and it required the use of anywhere from 20 to 40 double teams. Six months of the year their business is much heavier than the other six months, which accounts for the variation in trucking demanded. The experiment proved entirely satisfactory and they now have in service in addition to the above mentioned, four 3.5-ton trucks, four 5-ton trucks, one 1-ton truck, and one 1,000-pound car, making a total of eleven electric vehicles in service. The 1-ton car is in service practically all day and night. It is never put into the garage and is charged while standing waiting for its load. It runs to and fro between the publishing house and the freight station, carrying mail. It is equipped with an Edison battery and covers anywhere from 30 to 45 miles per day. The other trucks are used for hauling paper, 200 tons of which are carried into the warehouse each of five days in the week. In addition to this there are 175 tons of mail carried each day for six days in the week. The maximum which created a record for one day showed a total of 451 tons of mail and paper handled inside of 24 hours. Each one of these cars travels about two miles in a round trip, and they make ten trips per day. The service has been eminently satisfactory and has shown a very great saving in the cost of this end of the business.

The papers were discussed by Messrs. Rodman, Marshall, Street, Metcalf, Phillips and others.

The new secretary, Mr. Marshall, was then called on and made a few appropriate remarks.

The chairman mentioned two garages which had recently installed battery-charging apparatus for the use of the public.

Indirect Outdoor Illumination at the Panama Exposition.

A system of lighting never before utilized in expositions will maintain an illumination of the buildings at the Panama-Pacific International Exposition to a height of 125 feet, with a variation of but five per cent throughout this height. Nitrogen-filled incandescent lamps will be used.

The lamps will be ranged up and down standards of from 10 to 30 feet in height, and the eye of the observer will be shielded from the powerful direct rays by metal banners. In fact, all the lighting of the exposition palaces and grounds will be by the indirect system, from concealed sources.

A battery of forty-eight 36-inch searchlight projectors, will throw intense beams of light through color diffusers to polished glass jewels hanging upon the buildings. These beams will also be thrown upon the gardens and courts, and will play upon the beautiful white fog banks which often at twilight roll in through the Golden Gate.

TENNESSEE ELECTRICAL CONTRACTORS' ASSOCIATION.

Annual Meeting Held at Memphis, February 16 and 17.

The third annual convention of the Tennessee Electrical Contractors' Association was held at the Assembly Hall of the Business Men's Association of Memphis on February 16 and 17. The membership of this association is composed of electrical contractors from the states of Tennessee, Arkansas and Mississippi.

The Jovian League of Memphis assumed the duties of host and spared neither effort nor expense in the preparation of the entertaining features of the program.

In the absence of J. P. Lawrence, president of the Association, the first session was called to order by the secretary, J. A. Fowler. After a few remarks appropriate to the occasion, Mr. Fowler introduced J. M. Tuther, secretary of the Business Men's Club, who welcomed the contractors in a very hearty and felicitous manner. Mr. Tuther extended to all the members of the association and guests every privilege of the Club and issued membership cards to all who registered.

The secretary then called upon C. P. Chapin to read a paper on co-operation between central station and contractor, prepared by J. F. Ramier, of the Memphis Consolidated Gas & Electric Company, statesman of the Jovian Order.

Mr. Ramier attributed a large part of the phenomenal growth of his company to the ready response with which the contractors had received their plans. The growth in motor load was at first slow, but an active campaign on the company's part resulted in an increase of 25 to 30 per cent yearly. Then the contractors took hold and aided greatly in increasing this application of electric current. A similar experience was had with electric fans, an active campaign on the part of the contractors having shown excellent results. The experience of the central station has warranted the policy of keeping out of the business of selling appliances and giving the contractor moral support so that he is made in effect a strong part of the central-station organization. The central station is today facing problems such as the theft of current and fire protection, and hopes to have the assistance of the contractors along these and all other lines.

At the conclusion of this paper Mr. Fowler stated that W. R. Herstein, president of the Jovian League, was unable to be present and requested Mr. Watson to read the paper on

"Practical Jovianism" which Mr. Herstein had prepared.

Next in order was a paper prepared by J. A. Fowler, entitled "Humor and Pathos of Electrical Contracting." This will appear in our next issue.

After briefly outlining the program of the convention, Mr. Fowler adjourned the meeting until 2 p. m.

The afternoon session was called to order at 2 p. m. and James Singleton, of Nashville, was appointed temporary chairman. The regular order of business being disposed of, the chairman appointed a committee for the nomination of officers. The following slate was presented and accepted:

President, W. C. Tupper, Memphis.

First vice-president, J. A. Singleton, Nashville.

Second vice-president, F. H. Cantrell, Chattanooga.

Third vice-president, S. P. Watson, Knoxville.

Secretary, J. A. Fowler, Memphis.

Treasurer, H. S. Street, Memphis.

Director of the National Association, J. A. Fowler.

Mr. Tupper was then called upon to talk on the subject of legislative matters. Mr. Tupper told what had been accomplished in the way of state and city ordinances in Tennessee and Memphis, and offered to give whatever help he could to other communities.

Mr. Fowler followed this talk with a few remarks on the subject of "Employers' Liability Insurance Rate." Letters were read from some of the principal cities, showing that the rates ranged from 75 cents to $2.85 per $100. He said that Memphis is now paying over $2.00 and that they are fighting unceasingly for a lower rate. At this session the members endorsed the Compensation Act, which limited the employer's liability to $3,500.

Papers on the topic of "Consideration of Ethical Relations" were read by R. L. Clift and Edward Brown.

Mr. Cleft summarized his ideas in the form of the following ten precepts:

(1) You can find a better field than chasing the drops on the other fellow's wiring job. He has sockets, rosettes and cord, and a first right to sell his wares.

(2) If you find you can reduce your bid, after it is filed, do so before they are opened, or play with children who cry over lost marbles.

(3) Do you work up to the rule, and you can look the inspector in the eye and say, "I am as independent of you as you are of me."

(4) If your bid is too low to make a profit, lose like a gentleman and do not cry on the job because you neglected to read specifications or the other fellow's price showed your oversight.

(5) If you take a job at a known loss and rob your customer on extras, get a good lawyer for a son-in-law and it will help to keep him profitable in the family.

(6) Offer various articles in your stock as leaders at no profit and the shoe man will get your money that should have been put in your drawer.

(7) Fight competition with price and you will some day wonder why your friends seem so prosperous in the other lines of business.

(8) You cannot get all the business—the other fellow has friends and neighbors that do not know you.

(9) If you do not figure overhead, do not think you are fooling any one, for the sheriff will tell you some day to wake up and move.

(10) If you cannot maintain a reasonable legitimate selling price in a city, you can educate to the advantage of all as to estimating cost, for you have this on every job.

Mr. Browne made a plea for co-operation and consideration for the other fellow. While the securing of a contract means a skirmish, the competition should be in the open and above board. One should lose an order rather than his self-respect, but he can get both if the standard is kept high enough. Be ready to admit that the other fellow's job has merit and lose an order rather than speak ill of him. Instruct your workmen to do likewise. Do not cut any man's price on a job, for the public will crowd every order down until there is nothing but bankruptcy ahead. Do not let any person use you to tear down another's work. Do your work to the best of your ability and neglect no opportunity to raise the standard of the electrical field.

At this point Mr. Fowler announced that the next meeting of the Tennessee Electrical Contractors' Association would be held at Nashville at a time selected by the committee.

Tuesday Sessions.

It was planned to hold a reception for the delegates of the National Association at the Hotel Chisca at 10 a. m., but this part of the program was cancelled, owing to the delay of the train on which Ernest Freeman, president of the National Association, and some of the other distinguished guests, were to arrive, and the inability of Ell C. Bennett, of St. Louis, to be present.

The afternoon session was called to order at 2:45 p. m. and G. W. Hill, special representative of the National Electrical Contractors' Association, was called upon to describe to the delegates the bookkeeping system adopted by the National Association.

Since the publication of this system in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, a new estimating form has been added, which enables the contractor to keep a permanent record of all estimates made. Mr. Hill stated that he knew of several contractors who had deceived themselves in the belief that they were making a profit on every job when there was an actual loss which could not be detected because they did not keep the proper records. Mr. Hill had a complete set of forms with him and offered to explain the system to any of the members.

During Mr. Hill's talk President Freeman arrived and was accorded a warm welcome.

The topic of Mr. Freeman's talk was the National Association. To forcefully bring out the progress of the association, Mr. Freeman asked the delegates to consider what the present-day conditions would be without it. He pointed out the influence of the association in obtaining fair revision of the Code. He also urged the use of the new estimating sheet. It was his opinion that the labor cost on a job should be figured precisely the same as the material by the preparation of a table that would show the time consumed in putting certain specified wires through conduit the length of which had been determined. Installation of switches and, in fact, every detail of electrical construction, he stated, could be figured in the same way.

In closing, Mr. Freeman referred to the next convention of the National Association which will be held in Detroit, Mich., in July. He stated that from present indications it would be the largest and best meeting ever held, and he urged every member to make a special effort to be present.

G. M. Sanborn, of Indianapolis, past president and chairman of the Data-book-Committee, made a thoroughly interesting talk on the use of the data sales book.

J. T. Marron, of Rock Island, Ill., chairman of the Membership Committee, deviated from his topic "Why More Members" to discuss liability insurance. He pointed out the unfair discrimination in rates and advocated the plan adopted by the Illinois Contractors' Association of appointing a representative to see what could be done to effect a remedy.

Mr. Marron also suggested that the contractor keep an exact record of all installations, and, at certain periods, show the central station to what extent they have increased the load. This method, he said, would establish better feeling between the contractor and the central station.

Ernest McCleary, of Detroit, Mich., past president and chairman of Code Committee, explained in a brief manner the recent changes in the National Electrical Code.

P. R. Jaehnig, of Newark, N. J.,

chairman of the Legislative Committee, spoke on the subject of "New Laws," with special reference to electrical contractors.

G. H. Duffield, of Utica, N. Y., national secretary and editor of *The National Electrical Contractor,* made a very stirring talk on the journal of the association. The meeting was then adjourned.

Entertainment Features.

On Monday evening the delegates and guests attended a box party at the Lyceum Theater. An automobile ride was arranged for the ladies on Tuesday afternoon, which included a visit to the Automobile Show. The electrical parade was one of the principal features of Tuesday evening. This parade consisted of an automobile for each officer of the Sons of Jove, with the name of the officer prominently displayed in electric lights.

The candidates, 57 in number, followed and some of the prospective members were very conspicuous in a cage fitted to an automobile, which was also a part of the parade. The last float had mounted on it a gas engine generating electricity to supply current to a sign erected thereon which read "Electric Light and Power." The rejuvenation was held at the Orpheum Theater and the joviation took place immediately following in the banquet hall of the Hotel Chisca.

The following were in attendance: Jake Bateman, Clarendon, Ark.; A. N. Bentley, Electric Storage Battery Company, Atlanta, Ga.; S. J. Burke, Federal Sign Company, Memphis, Tenn.; S. A. Collins, Electric Supply Company, Memphis, Tenn.; G. H. Duffield, Utica, N. Y.; Clifford Demere, Memphis, Tenn.; Thomas Dies, Memphis, Tenn.; Ernest Freeman, Chicago, Ill.; C. B. Frayer, Edison Storage Battery Company, Chicago, Ill.; G. W. Hill, Rock Island, Ill.; John M. Hewitt, Memphis, Tenn.; W. H. Ilderton, Memphis, Tenn.; P. H. Jaehnig, Newark, N. J.; L. M. Long, Memphis, Tenn.; R. N. Lloyd, City Electric Company, Memphis, Tenn.; J. T. Marron, Rock Island, Ill.; T. N. Meriwether, Memphis, Tenn.; A. D. McWhorter, Memphis, Tenn.; Ernest McCleary, Detroit, Mich.; M. A. Patterson, Electric Supply Company, Memphis, Tenn.; J. H. Patterson, Newbern, Tenn.; G. M. Sanborn, Indianapolis, Ind.; G. B. Stevenson, Memphis, Tenn.; John M. Tuther, Memphis, Tenn.; F. Underwood, Memphis, Tenn.; T. R. Winfield, Memphis, Tenn.; E. J. Brown, Hollipeter and Jantz, Blythesville, Ark.; J. J. Brennan, Memphis, Tenn.; E. J. Browne, Browne and Borum, Memphis, Tenn.; F. C. Bragg, Electric Construction Company, Little Rock, Ark.; R. L. Clift, Electric Novelty Company, Memphis, Tenn.; P. E. Cooley, Hollipeter and Jantz, Blythesville, Ark.; Ike Contor, Terrell-Hedges Company, Chattanooga, Tenn.; C. K. Chapin, Memphis, Tenn.; N. W. Campbell, Arkansas Electric Company, Little Rock, Ark.; F. M. Fleming, Fairbanks Company, Louisville, Ky.; Jos. A. Fowler, Fowler Electric Company, Memphis, Tenn.; E. W. Frye, Electric Supply Company, Memphis, Tenn.; E. W. Grey, Grey Brothers Electric Company, Memphis, Tenn.; Fisher Harwell, Harwell Electric Company, Memphis, Tenn.; G. D. Hancock, Electric Supply Company, Memphis, Tenn.; W. P. Holcombe, Frank Adam Electric Company, St. Louis, Mo.; V. A. Henderson, Memphis, Tenn.; Walter Kleinschmitt, Electric Supply Company, Memphis, Tenn.; P. W. Lytle, Lytle Electric Company, Memphis, Tenn.; C. C. Lewis, Memphis, Tenn.; John Motley and Robert Motley, Motley Brothers Electric Company, Memphis, Tenn.; M. J. Mallory, Westinghouse Electric & Manufacturing Company, Memphis, Tenn.; W. A. Munding, Electric Supply Company, Memphis, Tenn.; F. S. Montgomery, National Metal Molding Company, Atlanta, Ga.; H. G. Mitchell, Electric Supply Company, Memphis, Tenn.; W. C. Mac Guire, Arkadelphia, Ark.; J. F. Ramier, Memphis, Tenn.; C. B. Rutledge, Bluff City Electric Company, Memphis, Tenn.; C. K. Steig, Memphis, Tenn.; W. A. Scott, Fairbanks Company, Louisville, Ky.; G. B. Shawver, Springfield, Tenn.; J. A. Shingleton, Nashville Machine Company, Nashville, Tenn.; A. J. Sharenberger, Sharenberger Electric Company, Nashville, Tenn.; H. G. Street, Memphis Electric Company, Memphis, Tenn.; George W. Steenbergh, Electrical Review and Western Electrician, Chicago, Ill.; Burns Stewart, Memphis, Tenn.; R. A. Street, Memphis Electric Company, Memphis, Tenn.; Paul Towner, Towner and Company, Memphis, Tenn.; W. C. Tupper, Bluff City Electric Company, Memphis, Tenn.; Theo. C. Treadway, Treadway Electric Company, Little Rock, Ark.; R. L. Whitfield, Nashville Electric Company, Nashville, Tenn.; V. A. Watson, Electric Supply Company, Memphis, Tenn.; C. J. Watson, Electric Supply Company, Memphis, Tenn.; S. P. Watson, Acme Electric Company, Knoxville, Tenn.

Inter-Insurance for Ohio Utilities.

The insurance Committee of the Ohio Electric Light Association, consisting of D. L. Gaskill, J. C. Martin and Elam Fisher, has investigated the question of inter-insurance as a means of reducing the rates for fire and liability insurance among utility companies of the state. This committee has investigated the Utilities Indemnity Exchange and reports it to be reliable and worthy of the confidence of the members of the Association as a means of reducing premiums about 40 per cent.

Power Conditions in Massachusetts.

The Amherst Power Company, a transmission company supplying energy to a large territory in central Massachusetts, and closely related to the Turners Falls Company which operates a large hydroelectric plant on the Connecticut River, has the following manufacturing concerns as its customers: Fisk Rubber Company, whose normal load is 3,000 horsepower; Springfield Street Railway Company, 2,000 horsepower; Chicopee Manufacturing Company, 750 horsepower; and the Page-Storm Company, with a normal load of about 400 horsepower. The Amherst Power Company has a contract with the United Electric Company of Springfield by which it is prepared to supply about 2,500 horsepower for local service.

The Agawam Electric Company, another transmission company related to the Turners Falls Company, furnishes 200 horsepower to Lane's Quarry, Westfield; 150 horsepower to the West Springfield waterworks and about 300 horsepower to the Ramapogue Ice Company. The Northern Connecticut Light & Power Company takes about 700 horsepower for lighting services in six towns.

Local Fire Alarm Systems in New York Factories.

A fire-alarm signal system with a sufficient number of clearly audible signals is required in every factory building over two stories high in which more than 25 persons are employed above the grade story by the new labor law of New York state.

A sub-committee of the industrial board has been at work drafting rules and regulations for factory fire-alarm systems which will be issued this month.

At present the most complete rules for factory alarm systems are those in use in New Jersey. Some engineers do not favor open circuits in fire-alarm systems, which are permitted in New Jersey. It is thought that the New York rules will require closed circuits. New Jersey has regarded electric siren horns rather more favorably than gongs.—*Safety Engineering.*

License Required in Milwaukee.

On February 16 an ordinance went into effect in Milwaukee, Wis., regulating the installation of electric wiring and apparatus. Any person or firm wishing to engage in this work must first obtain a license, the fee for which is $25. The city building inspector is given authority over electrical inspection. Penalty for violation of the ordinance consists of imprisonment or fine ranging from $5 to $250.

LETTERS TO THE EDITOR.

Utilization-Factors.

To the Editor:

The article by Mr. J. B. Jackson in the issue of February 7, on planning lighting installations, was very interesting and shows that since the wiring contractor plans about nine-tenths of all lighting installations he should be in a position to calculate beforehand the illumination required for a certain purpose. There seems to be a lack of information on the subject of the "utilization-factor" of various style and shapes of the new glassware; the writer has written several large makers of reflectors and so far has only been able to get a reply from one concern that seems to have any data such as the illumination curves about its various styles of reflectors, utilization-factors for bowls and dishes used in semi-indirect lighting, whether shallow, medium or deep. As this quantity is of much importance in the final results, there should be a more complete subdivision of types and styles of reflectors.

For instance, on the chart given out by the National Lamp Works the table of utilization-factors is as follows for light ceilings:

Unit	Walls Light	Medium	Dark
Prismatic glass	.60	50	40
Opal or milk glass	.50	42	33
Decorative or art glass	.30	25	20
Semi-indirect	.40	35	30
Indirect	.38	35	32

These values are rather indefinite, as they leave one to guess just under which classification the particular glassware he is working with belongs, also the style and shape of the reflector, whether bowl, dish or sphere. While we are at it why not try and get more accurate data on the various kinds of reflectors, especially the newer styles of bowls for semi-indirect use which seem to be gaining favor now. The effects now obtainable with modern glassware are not a mere accident and the public is coming to appreciate the difference between a properly planned lighting installation and one that is put up regardless of results or efficiency.

E. M. Raetz.

Rochester, Minn., February 9, 1914.

Tungsten Lanterns from Arc Lamps.

To the Editor:

It might be interesting to some of your readers to know that since the tungsten lamps have replaced many of the other types of lamps, principally the inclosed arcs, that instead of relegating the latter to the scrap pile they can be very cheaply transformed into a very neat-appearing street or factory fixture by simply removing the lamp mechanism and making a plate to fasten to the bottom of the center supports, in which are drilled two or four holes, as may be required. Into these are inserted and soldered four or two lamp sockets, the main portion of which together with the wiring, are inclosed within the lamp casing.

These old lamps when transformed will easily hold four 100-watt lamps and together with the reflector, which incidentally affords ample protection against the elements, makes a very neat-appearing fixture.

I have changed many of them and find that they serve the purpose equally as well as the most expensive fixture.

J. W. Walters.

Latrobe, Pa., February 11, 1914.

BOOK REVIEWS.

"Electricity for the Farm and Home." By Frank Koester. New York: Sturgis and Walton Company. Cloth, 280 pages (5¼x7½ inches), illustrated. Supplied by the Electrical Review Publishing Company for $1.00.

This little book is one of a series included in the Farmer's Practical Library. In casting about for someone to prepare a reasonable study of electricity for the farm and home a happy selection indeed has been made in securing Mr. Koester to prepare this work. By training, experience and sympathy Mr. Koester is preeminently qualified to discuss the subject. He is familiar with German practice, from which we are able to take a great many useful lessons. He has probably done more in one way or another to stimulate the development of apparatus adequate to meet the demands of rural communities and to disseminate information with respect to the utilization of electricity on the farm and in the home than any other contemporary writer. The present work is divided into 15 chapters and covers practically every phase of the subject from the benefits of agricultural electricity, central-station service, to the cost of operating, the use of electricity in the manufacture of by-products, diverse applications of electricity, electrical power in irrigation and electric stimulation of vegetation. There are 53 illustrations which enhance the value and increase the interest of the book. At the end of each chapter there is a series of questions which serve to fix the impression already created by the simple and lucid explanatory discussion of each particular.

"The Price of Inefficiency." By Frank Koester. New York: Sturgis & Walton Company. Cloth, 440 pages (6x7½ inches). Supplied by the Electrical Review Publishing Company for $2.00.

The author has gathered together an immense amount of material respecting the apparent inadequacy of our conception of the proper utilization of any of our resources and the total inefficiency and depravity of our methods of disposing of the things that are. If all that the author says be true we are arraigned before a most conspicuous indictment for uselessness of purpose and misapprehension as to a proper regard for either our own welfare or the welfare of those depending upon us. Were it not for an underlying spirit of hardy optimism the reader would be well nigh disgusted and disheartened with the exposures that are piled one upon the other. There is no doubt but that as a nation we are guilty of some appalling wastes, but it is doubtful indeed whether the reasons for this condition are not considerably a matter of evolution and a reward of circumstances rather than because of the direct desire upon the part of those who have made the country great to bring about wastefulness in our many avenues of effort. The book is valuable because it gathers under one cover pretty nearly everything of a similar character that has been published for a good many years. Consequently it is easy to review and become acquainted with the sum total of our iniquity. The author has made a considerable study of the literature of the subject and has undoubtedly given the matter first-hand analysis. It is too bad, however, that there is not more of constructive suggestion of a practical nature.

Electrical Aging of Alcoholic Beverages.

Recent progress in the practical application of electrical current in the manufacture of alcoholic liquors has been described in *L'Electricien*.

Spirituous liquors as commercially manufactured contain organic compounds, particularly aldehydes, which are undesirable, and various attempts have been made to change them by both chemical and electrical means, as well as by distillation.

In Naudin's method electrolysis is used before distillation in order to form alcohol from the aldehydes by the action of hydrogen. The liquid is mixed with a solution of sulphuric acid of one part in one thousand. Platinum electrodes are used and after treatment the mixture passes into a vat containing enough granulated zinc to neutralize the acid. It is then distilled. By this means the commercial efficiency is 15 per cent higher than by the ordinary process.

Ozone has been employed in various ways, one of which is to bubble a stream of electrically generated ozone through the liquid. Chemically prepared ozone has also been used. This process not only destroys the organisms of secondary fermentation but assists the formation of the ethers which give bouquet to the wine. This treatment improves the aroma and taste of inferior qualities of real wines, but artificial wines are deteriorated by the process.

New Electrical and Mechanical Appliances

Twin Receptacles for Ralco Plugs.

In machine shops and in factories where portable electric tools are much used there has arisen a demand for a twin receptacle to which portable motors and lamps can be readily connected. This has been met by the development of a twin receptacle suitable for the Ralco plugs described in these columns a few months ago. These receptacles are made fused or fuseless. One of them consists of two 30-ampere receptacles fitted into a compact cast-iron box in whose design special attention was given to the ease with which it could be wired, and to assist the electrician ample space was provided for that purpose. The box is primarily, designed for inside use, and is fitted with three-quarters-inch knockouts on two sides and top. If the receptacle is required for outside use, it can be made waterproof.

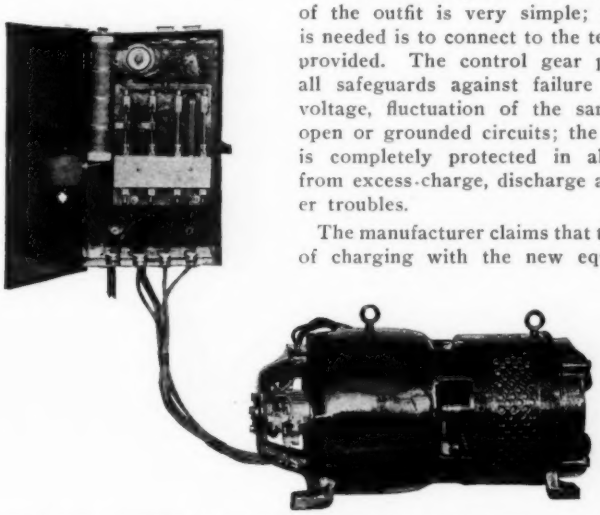
Twin Receptacles and Cutout Box.

Another outfit is made of almost identical construction except that it has space on top for either one of two cutouts. When equipped with one cutout the boxes are marked 15 amperes per plug; when equipped with two cutouts, 30 amperes per plug, because the fuse block governs the rating. Fuse blocks and receptacles come wired, so that all that is necessary in order to install the outfit, is to bring the line wires down to the terminals of the fuse block. A door is provided in order to make it easy to replace a fuse when blown.

These receptacles have been placed on the market by the Central Electric Company, 320 South Fifth Avenue, Chicago, Ill.

Lincoln Automatic Battery-Charging Outfit.

A practically automatic electric-vehicle storage-battery-charging outfit has been placed on the market by the Lincoln Electric Company, Cleveland, O. It comprises a two-bearing motor-generator set and control panel therefor. The outfit is designed particularly for charging from alternating-current circuits, although a direct-current motor can be furnished where direct current is supplied at unsuitable voltage, say 500 volts.



Lincoln Battery-Charging Motor-Generator and Automatic Control Board.

The outfit is intended especially for charging lead storage batteries. The standard size is suitable for a 40-cell type 9, 11 or 13 MV Exide battery or any lead battery of similar capacity. This size is suitable for pleasure cars or trucks up to 2,000 pounds rating. Special sizes for other battery capacities and voltages can be obtained.

Probably the most distinctive feature of the equipment is that it is so automatically controlled as to give a tapering and non-gasing charge to the battery. This type of charging is becoming recognized as the ideal method of charging lead batteries because the old method of constant-current charging produced excessive gasing when full charge was approached, which resulted in early destruction of the battery. The tapering charge supplies a heavy current at first and gradually reduces the charging rate to keep it below the point at which injurious gasing begins. Thus the life of the battery is increased from 50 to 100 per cent over that of a battery charged at constant current. Depreciation is retarded and mileage increased. Overcharging can be carried on indefinitely at a low rate without damage to the battery.

The control equipment is all mounted on the panel and is already wired to the machines, so that installation of the outfit is very simple; all that is needed is to connect to the terminals provided. The control gear provides all safeguards against failure of line voltage, fluctuation of the same, and open or grounded circuits; the battery is completely protected in all cases from excess-charge, discharge and other troubles.

The manufacturer claims that the cost of charging with the new equipment is much less than with other methods, when proper account is taken of the increased battery life and efficiency, elimination of rectifier-tube renewals and other troubles. A battery can be put on charge in completely exhausted condition, partly discharged or almost fully charged state without fear of damage. The battery can be left on charge indefinitely because the current is reduced to a very low value when the full-charge condition is attained.

Spanish Government engineers are making surveys and estimates for a double-track electric railway from Madrid to the nearest point on the French frontier.

Franks Adjustable Fixtures for Factory Sewing Machines.

The severe competition in the clothing industry has necessitated that the closest attention be given to economy of production and to increasing the efficency of employees. It has been found that good lighting is essential both to satisfactory production and the welfare of operatives. This is particularly true of those who work on sewing machines. General lighting has been found inadequate except when working on simple white goods; local lighting is insisted on by the operatives in nearly all other cases.

A study of these requirements has resulted in the development of a new system of sewing-machine lighting, which makes use of the well known Franks adjustable fixtures. The distinctive feature is the use of a readily adjustable ball joint, which permits setting of the fixture to any angle or shifting it by the touch of a finger and without manipulating set screws or other time-consuming adjustments. Ten-watt lamps are used to insure economy in current consumption. The reflector protects the eyes of the operative from glare and throws the light rays where they are needed. The bulb is also protected from breakage.

Adjustable Fixture for Factory Sewing Machines.

Although the installation can be made through hanging drop cords, the most satisfactory and also correct method of installing these fixtures is to run conduit underneath the tables, supported by pipe hangers, then use either a T Condulet, an Adaptibox, or similar fitting, for the machines. The fixture is so placed to the side of the head of the machine that it allows the goods to pass through the machine readily and does not in any way interfere with the operative. It is a great improvement over exposed pendent lamps.

These fixtures are made by the Franks Manufacturing Company, 1524 Fourth Avenue, Rock Island, Ill.

Safety Device for Curved Subway Platforms.

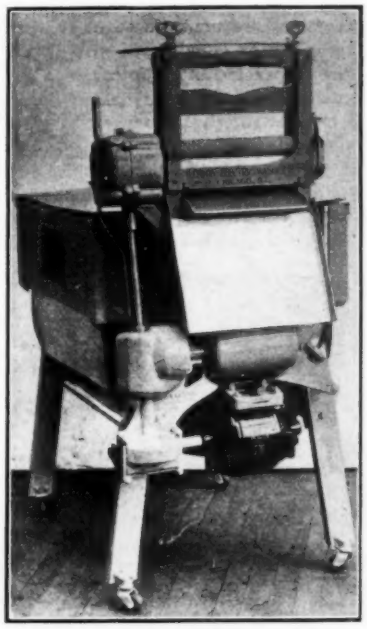
At a few points in the New York subway system stations are unavoidably located at curves in the line. In order to provide necessary clearance between the platform and cars there is left a dangerous gap between the platform and either the center or ends of the cars, depending upon whether the platform is concave or convex. A number of accidents have happened at these dangerous pitfalls. Since it was found impossible to change the station to a straight portion of the track, efforts were made to find some way to close the gaps while a train is at the station.

There has recently been developed a means for doing this by projecting segments of the station platforms against the cars after the train has come to a stop. This is done by means of compressed-air cylinders, which are electromagnetically controlled. As a 10-car train enters the station an operator takes his position at the forward end of the train and a few seconds before the train has come to a stop he moves a control handle to the operating point. Through the electromagnet control air is admitted to the cylinders and hidden segments beneath the edge of the platform are pressed against the car, closing the gap. When the train leaves the station its motion causes automatic reversal of the electropneumatic action and the segments of the platform recede. The preliminary test of this device has been very successful and it is expected to equip at least the Fourteenth Street station with a complete installation.

The Conlon Electric Washing Machine.

One of the conspicuous features in the design of the new Conlon electric washer is the care taken to insure its complete safety. Every moving part is completely inclosed so it is impossible to catch the fingers or the dress. The tension on the wringer rolls can be instantly removed by a patented release, thus preventing injury from this source to the operator or to the clothes. A friction clutch protects the motor in case of an overload. No belts or chains are used, the motor driving through a steel worm and bronze worm gear which run in hard grease. Quiet operation is thus obtained. The motor and the drive are so located that they are out of the way and the whole machine is made neat and compact.

The machine is lined throughout with metal, making it highly sanitary since there are no cracks and crevices to absorb dirty, soapy water. The machine is made in three sizes, driven respectively by one-sixth, one-fifth and one-fourth horsepower Westinghouse electric motors which can wash and wring at the same time. It is manufactured by the Conlon Electric Washer Company, 312-320 North May Street, Chicago.



Conlon Electric Washer.

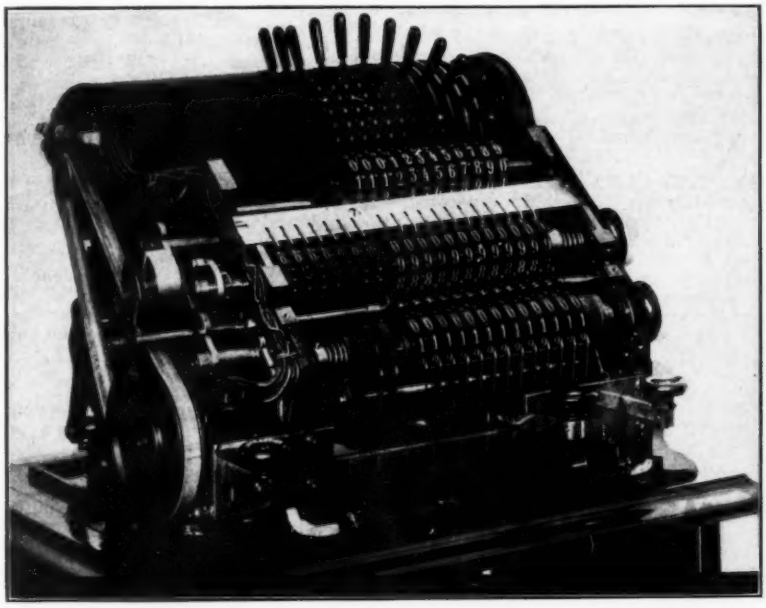
A French Electric Calculating Machine.

The new electric calculating machine known as the "Eclair" is a Paris invention, and it is claimed to solve the problem of a rapid calculation for modern business use, as it reduces mental effort to a minimum and suppresses manual work in a great degree. Its movements are carried out for the most part by electromagnets. Without entering into the details of

the apparatus, we may state that the figures are first set upon certain of the drums by the use of the twelve levers which are seen at the top of the device, and by the combined action of these levers with the three operating keys placed at the bottom of the apparatus, the results, such as addition, etc., are seen to appear automatically upon suitable drums in another place, these drums being rotated by electromagnetic action. The two milled buttons at the side only serve to bring the drums back to zero in order to recommence work.

Aside from ordinary work, such as addition, division, etc., other calculations can be made, as for instance extraction of roots, interest, exchange and discount determinations, so that it will be seen that for business work the machine is likely to be very useful. It is claimed to be far more rapid in its work than all others on account of the small amount of mechanical work required by the operator, hence a great increase of speed is possible. As all the actual work in making up the results is done by the self-contained action of the machine, its operation is independent of any nervousness on the operator's part, and this it is said is the source of the greater part of the errors made by other calculating machines. It reponds at once to the desires of the operator and with its own energy which nothing can influence. Another point is said to be that no rough usage can be given the working parts, since it is the current that carries out the movements and not the operator. All manipulations are made by levers or keys which are now admitted to be the most practical for this class of work.

This machine has been perfected and placed on the market by the Société de le Calculatrice Electrique, 6 Rue de Hanovre, Paris, France.



Electrically Driven Calculating Machine.

Exploding Submarine Mines by Wireless Telegraph.

Manrico Compare, an Italian electrician, has invented a wireless system for exploding mines at sea. The American consul at Leghorn, in reporting a successful demonstration of the invention, says the instrument was placed in a small building in a park. Two mines were put in the sea about 450 feet from the shore and 50 to 100 feet apart. The inventor exploded one mine and, after a brief interval, the second one. The distance from the apparatus to the mines was about 2,500 feet. Raised ground with trees, solid stone fences, and buildings, and a stretch of water lay between the apparatus and the mines. Three naval boats with wireless apparatus on board were about one and one-half miles farther out at sea, and the wireless station of the Royal Naval Academy was within a mile. The two tests demonstrated that the manipulator of the apparatus could control the destination of the waves sufficiently well to explode the mines separately.

Proposed Railway Electrification at Bombay, India.

About a year ago, at the suggestion of the Governor of Bombay, India, two electrical engineers of well known reputation, C. H. Merz and F. F. P. Sisacre of the English firm of Merz & McLellan, visited Bombay for the special purpose of considering the possibility of profitably electrifying the Bombay suburban railways systems and the adjacent railway system of the Port Trust. These engineers have now submitted a report to the boards of the Bombay, Baroda & Central India Railway Company, the Great Indian Peninsula Railway Company, and the Bombay Port Trust, who are the authorities immediately concerned. Their report heartily recommends as a practical proposition a proposal to furnish Bombay with a first-class system of electrical railways communicating with its suburbs. The capital cost of such electrical railway equipment is estimated at nearly $4,000,000. The report states that there would be a gain by electrification of about $350,000 annually, an increase of about 20 per cent in speed, also improved punctuality, greater frequency of trains, and the development of residential area. For the Bombay suburban lines there is proposed a train unit of three coaches; that is, three coaches coupled permanently together and having a motor in one coach, so that they can be run as a small train by themselves, or joined to another similar unit to make a longer train. A train of three, six, or nine coaches can thus be made up.

Branch Offices of the Bureau of Foreign and Domestic Commerce.

In order to permit of more direct co-operation with American manufacturers and exporters, branch offices of the United States Bureau of Foreign and Domestic Commerce have been opened in New York, Chicago, and New Orleans, where the Bureau's publications, samples of foreign-made products, plans and specifications of construction work abroad, lists of foreign dealers in various lines, manuscript consular reports, and similar documents are available to interested individuals and firms. Reserved addresses in connection with "foreign-trade opportunities," published in the *Daily Consular and Trade Reports*, may be obtained by application in letter form from these offices. It is suggested that firms in the districts served by these branch offices acquaint themselves with the material available through them, as time may frequently be saved by making application to the branch office instead of to the Bureau in Washington. The addresses of the branch offices are as follows:

New York, Room 315, United States Customhouse.

Chicago, 629 Federal Building.

New Orleans, Association of Commerce Building.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

ATTACHMENT PLUGS, Fuseless.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" 660 watts, 250 volts; catalog No. 500, non-separable porcelain.

Approved January 17, 1914.

CABLES, Armored.—Columbia Metal Hose Works, Cottage and Orient Streets, Bayonne, N. J.

Marker: letter "C" stamped in the armor at intervals of about six inches.

Armored cables shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, have labels attached to each coil.

Approved January 20, 1914.

FUSES, Cartridge Inclosed.—General Electric Company, Schenectady, N. Y.

"G. E." glass-tube fuses, 250 volts.

For rosettes, attachment plugs and for protection of instruments and pilot lights on switchboards: catalog No. 132,765, one ampere; catalog No 132,-766, two amperes.

For rosettes only; catalog No. 132,767, three amperes.

Present specifications do not admit the use of special fuses such as the above as a substitute for standard designs except as indicated in notes preceding Rule 53*d*, and following Rule 2*e*, respectively.

Approved January 6, 1914.

FUSES, Open Link.—Metropolitan Engineering Company, 1238 Atlantic Avenue, Brooklyn, N. Y.

Repulsion-type fuses, 35-100 amperes, 250 volts, for use in cutout bases, 189 and 190.

Approved December 27, 1913.

LIGHTNING RODS.—Dodd & Struthers, 720 Sixth Avenue, Des Moines, Iowa.

"Dodd System" of lightning protection for buildings.

In this system woven copper cables and copper tubing are used, having a weight not less than three ounces per foot and intended for the protection of residences, barns, stores and similar buildings where the maximum height of any point does not exceed 60 feet and where corrosion is not liable to occur to any extent.

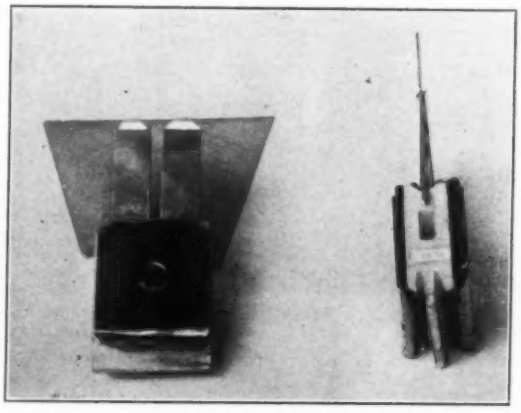
Installations of this system are to be made by men in the employ of the manufacturers and should in all cases be made in conformity with the "Suggestions of the National Board of Fire Underwriters for Protection Against Lightning as recommended by the National Fire Protection Association," edition 1913.

Approved January 17, 1914.

RECEPTACLES, for Attachment Plugs.—Harvey Hubbell, Incorporated, Bridgeport, Conn.

Adapters, 660 watts, 250 volts (combining Hubbell plug with Edison shell receptacles); catalog Nos. 5,424, 5,737 and 5,897 for use with receptacles rated 20 amperes, 250 volts.

Approved January 6, 1914.



Open-Link Fuse.—Metropolitan Engineering Company.

RECEPTACLES, Standard.—Connecticut Electric Manufacturing Company, Bridgeport, Conn.

"C E. M. Co." 660 watts, 250 volts.

Sign; catalog Nos. 777, 967.

Approved January 17, 1914.

RECEPTACLES, Standard.—E. H. Freeman Electric Company, Trenton, N. J.

Border light receptacles; catalog No. 273.

Approved January 6, 1914.

RECEPTACLES, Standard.—C. S. Knowles, Chelsea, Mass.

"C. S. Knowles" 600 watts, 250 volts.

Cleat receptacle, catalog No. 50,175.

Approved January 17, 1914.

RECEPTACLES, Standard.—Pass & Seymour, Incorporated, Solvay, N. Y.

"P. & S." brass-shell, closed or slotted bases.

Key, 250 watts, 250 volts; molding, "Fluto" catalog No. 471. Pull, 250 watts, 250 volts; molding, "Fluto" catalog No. 473.

Also the above types with shadeholders attached; key type with composition or insulated metal key, or with "Shurlock" attachment.

Approved January 17, 1914.

RECEPTACLES, Standard.—Pass & Seymour, Incorporated, Solvay, N. Y.

"P. & S." brass-shell, closed or slotted bases.

Keyless, 660 watts, 250 volts; for use on metal ceilings, catalog No. 412; for mogul base lamps, "Fluto" catalog Nos. 1, 44.

Molding, "Fluto," catalog No. 472.

Also the above types with shadeholders attached, or with "Shurlock" attachment.

Also connecting block for molding bases, catalog No. 489.

Approved January 19, 1914.

ROSETTES, Fuseless.—Connecticut Electric Manufacturing Company, Bridgeport, Conn.

"C. E. M. Co." three amperes, 250 volts.

Combined cleat and concealed single-piece type, catalog No. 2,696-B.

Molding two-piece type, catalog No. 2,755.

Approved January 17, 1914.

SOCKETS, Standard.—Pass & Seymour, Incorporated, Solvay, N. Y.

"P. & S." porcelain-shell sockets.

Key, 250 watts, 250 volts; catalog Nos. 485, 488.

Standard for use only in places where they will not be exposed to hard usage.

Approved January 17, 1914.

SWITCHES, Automatic.—Automatic Switch Company, 131 Liberty Street, New York, N. Y.

"S. V. R. Syphon Vacuum-Regulator" switch.

A single-pole snap switch connected in series with one of the following motors coupled to a rotary pump for producing vacuum in an "Arco Wand" vacuum cleaning system and so arranged that when the vacuum falls the switch is automatically closed.

The motors are as follows:

Direct-current; Roth Brothers & Company, 0.75 and 1.50 horsepower, 230 volts.

Alternating-current; Wagner Electric Manufacturing Company, 0.75 and 1.50 horsepower, 220 volts.

Standard when used in connection with a fused double-pole switch.

Approved January 17, 1914.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

ROCHESTER, KY.—The mayor may be addressed regarding plans for an electric light plant. G.

NEWTON, TEX.—H. T. Howard is planning to erect a plant to furnish electric lights for this place. D.

LARNED, KANS.—The Council is planning ways and means to secure a municipal lighting plant.

WILLOWS, CAL.—Improved lighting will be established. Address H. G. Keesling for desired information.

GATLIFF, KY.—The Gatliff Coal Company is planning to install electric light facilities for coal mining camps.

MINDEN, IOWA.—Bids will be asked at once for the construction of an electric plant. Address the city clerk.

RICHLANDS, N. C.—An electric plant will be installed in the spring. Address the town clerk for particulars.

HOUSTON, TEX. — Improvements valued at $23,000 will be made by the Houston Lighting & Power Company.

BARRY, ILL.—The citizens of this place are planning to erect a lighting plant here. Address Mayor Beavers.

LOWELL, WIS.—W. F. Pease, of this place, is promoting the establishment of an electric light plant here and at Reeseville.

MELBOURNE, FLA.—$5,000 in bonds has been voted for the construction of an electric light plant. Address the town clerk.

OVID, MICH.—The Council plans to install an electric pump for the water works. Address the city clerk in regard thereto.

HANCOCK, IOWA.—The Council is negotiating for an electric-light plant. Address the city clerk for general information.

GAYVILLE, S. D.—The Council is considering ways and means to establish a municipal lighting system. Address the city clerk.

PORTLAND, N. D.—The Council plans to establish a municipal lighting plant. Address the city clerk for further information.

NEWCASTLE, O.—The Council will award a new contract for electric lighting. Address the city clerk for further information.

WHITESBURG, KY.—The Commercial Club may be addressed regarding plans for the establishment of an electric light plant.

LOUISVILLE, KY.—The Louisville Silo & Tanks Works, of which W. C. Curry is manager, is in the market for 20-horsepower in motors.

KENYON, MINN., Business men are forming a company and will install electric lights for the town. Address F. W. Patridge for information.

QUINCY, FLA.—The city will install additional machinery in the electric power plant to cost $2,500. Address the mayor for further information.

MISSION, TEX.—A stock company is being organized to install a light, water and ice plant. Address E. O. Scott for general information.

ASTORIA, ORE.—The Seaside Light & Power Company is preparing to extend its transmission line across Clatsop plains to the south line of Warrenton.

ORLEANS, IND.—The Orleans Electric Light & Power Company has been incorporated with a capital stock of $35,000 by E. M. Heise, Albert Heise and others.

THROOPVILLE, N. Y.—The citizens are considering ways and means to secure electric lighting. Address S. C. Houghaling, chairman of Committee, at Auburn.

LEXINGTON, KY.—The City Commissioners are co-operating with the Commercial Club for the establishment of an ornamental lighting system on Main street. G.

HELENA, MONT.—The Standard Engineering Company has asked for a franchise to furnish light and power. Address D. J. McConnell, city clerk, for desired particulars.

SHEBOYGAN FALLS, WIS.—$49,000 in bonds have been voted for the construction of an electric-light and power plant. Address the city clerk for general information.

ST. CLOUD, MINN.—Merchants of Seventh Avenue will circulate a petition for the installation of a "Wihte Way" system of lighting. Address the city clerk for particulars.

LOUISVILLE, KY.—A considerable horsepower in motors will be required by Jones & Hughes for a candy factory and coffee-roasting plant, which they are planning to establish. G.

SALINA, KANS.—The stockholders of the Salina Light, Power & Gas Company will make a number of electric extensions throughout the year. Address Walter Grundy secretary.

ELLETTSVILLE, IND.—The Southern Indiana Light & Power Company, which operates a plant at White River, will construct an extension of its lines from Bloomington to Ellettsville. G.

BOWLING GREEN, KY.—The City plans to enlarge and improve the electric light plant and provide power for an ornamental street lighting system. Address James H. Kilkerson, superintendent.

CITY OF MEXICO, MEX.—The Federal Government has granted a concession to Guillermo Novoa for the use of the waters of the Purification River for the generation of electric power. D.

EUFAULA, ALA.—In order to better the lighting service furnished to the residents of Eufaula by the municipal power plant which was built two years ago numerous improvements are proposed. Address the mayor.

RICHLAND, IOWA.—A favorable proposition was submitted to the Council by Mr. Van Meter of the Sigourney Transmission Company, relative to furnishing electricity for this city. A franchise will have to be granted.

FLAT RIVER, MO.—There is a movement well under way to organize a stock company, with a capital of $40,000, to build and operate an electric plant, to supply light and power to the towns of Flat River, Elvins and Desloge.

IRON RIVER, MICH.—The Peninsular Power Company will spend $80,000 to $100,000 in Iron River this summer remodeling and adding to its power plant. This was the announcement of L. T. Stirling, assistant secretary of the company.

MERCHANTVILLE, N. J.—The Public Service Electric Company is planning for the installation of additional incandescent street lamps, and has entered into negotiations with the Borough Council for the improvement.

WORCESTER, MASS.—An addition to the Webster Street powerhouse of the Worcester Electric Light Company is being planned. Superintendent Fred M. Smith will send the specifications to contractors when the plans are ready.

MAGAZINE, ARK. — The City Council of Magazine has granted a 20-year franchise to the Magazine Electric Company for a continuous current in this city. The Company will at once install a modern and up-to-date plant and system.

CENTRAL CITY, KY.—The Central City, Greenville & Drakesboro Traction Company, will construct a central steam-driven electric plant on the Green River, two miles from Central City, and transmit electricity to 21 coal mines and other plants within a 200-mile radius.

LOVELAND, COLO.—Through the appropriation by the City Council the preliminary work of constructing a municipal light and power plant on the Big Thompson River, 14 miles west of the city, will be started at a cost of $120,000. Address the city clerk.

YOUNGSTOWN, O.—The Council will employ an expert electrical engineer to represent the city's interest and assist the Lighting Committee of the Council in securing from the lighting company a contract for a better and cheaper system of light for the city of Youngstown.

ABILENE, TEX.—The Central West Texas Irrigation Association is considering the proposition of building transmission lines from this city to carry electric power from the Abilene power plant to the territory around Abilene for the operation of irrigation pumps and farm machinery. D.

WAUCOMA, IOWA.—The Council is planning ways and means to secure a municipal light plant and arrangements have been made to call a special election on bonding the town for $12,000 to pur-

chase the rights and property and to erect and operate a light plant. The election will be held in March.

GRAND RAPIDS, MICH.—A delegation of Madison Square Board of Trade officials met with the Ways and Means Committee of the Council, for the purpose of advancing the plan for a boulevard lighting system in that locality. The business men of Madison Square have sufficient money with which to purchase the posts and lights and they now want the city to furnish the power. Address city clerk.

SHELDON, N. D.—Instead of putting in an electric light plant, Sheldon may secure its power from Enderlin over a transmission wire. Enderlin has a splendidly equipped plant, capable of manufacturing enough electricity for the local needs there and here as well. It would cost about $5,000 to construct the wires. Local people believe the plan preferable to having the town establish a plant of its own.

CHARLOTTE, N. C.—Contracts involving approximately $1,000,000 have been let by the Southern Power Company to the Hardway Construction Company of Columbus, Ga., and the Parker-Brooks Construction Company of Macon, Ga., for the building by the former of the big dam and power station at Lookout Shoals on the Catawba River, between Iredell and Catawba Counties, and the construction by the latter of five miles of railroad from the Southern Railway to the site of the development. The Lookout Shoals will develop 26,400 electrical horsepower. The machinery installation consists of four 6,000-horsepower uints and two exciter units. A fall of 74 feet will be secured by reason of the location of the dam at a point just above the Island Ford road.

POUND, WIS.—The prospect of securing electric light and power for this village and Coleman looks brighter than ever. A stock company will be organized composed of local men, and some outside capital will also be secured. The capital stock of the company will be $10,000 and it is expected that the plant will be ready for operation by July 1. Practically an unlimited amount of electric current will be obtainable and power for manufacturing purposes can be secured very cheaply. The source of the current will be from the High Falls plant of the Wisconsin Public Service Company. The local company will be known as the Coleman-Pound Light & Power Company, and it is expected that the incorporation of the company will take place within the next two weeks.

HUNTSVILLE, ALA.—J. W. Worthington, vice-president of the Alabama Power Company, has in hand tentative plans for the development of the enormous power of the Muscle Shoals in the Tennessee River. These plans, which alone cost $25,000, will be put in use if the government accepts the bid of Mr. Worthington's company for a lease on the power rights for a long term of years. So far this is the only bid that has been made. The project involves millions of dollars. Two immense dams are provided in the plans. It is estimated that a million horsepower can be generated. Mr. Worthington believes that the Engineering Board of the army will recommend that the plans for developing Muscle Shoals be adopted.

TELEHONE AND TELEGRAPH.

(Special Correspondence.)

VESTA, N. Y.—The Local Telephone Company, David J. Nichols, president, will improve and extend its lines.

MUSCATINE, IOWA.—The Iowa Telephone Company contemplates improvements here to cost $25,000.

NEW RICHMOND, WIS.—St. Croix Telephone Company is planning to erect a modern telephone exchange here.

WILLIS, TEX.—Edmund Woolridge has purchased the Willis Telephone system from Captain Green, and will make improvements. D.

WINGO, KY.—The Mitchell Telephone Company has been incorporated with a capital stock of $100 by R. K. Johnson and others.

PLANT CITY, FLA.—The City Council is considering an ordinance granting a franchise to Hartline and Sons to establish a telephone system.

RED LAKE FALLS, MINN.—The Grodon Valley Telephone Company will ask for a franchise to extend its line into this city. Address N. L. Rossen for information.

PANORA, IOWA.—The Panora & Jefferson Road Mutual Telephone Company has been incorporated with a capital stock of $10,000 by S. D. Orr and others.

GLEN PERRY, IDA.—J. I. Henton, manager of the Mountain State Telephone Company, will install a new plant here next spring, including new wires, poles and equipment.

STOCKTON, CAL.—The Western Union Telegraph Company will expend $40,000 reconstructing its line from Stockton to Los Angeles, and enlarging its local offices and equipment.

PACIFIC, WASH.—Farmers in this vicinity have organized to install a Farmers Telephone system, and the Pierce County Commissioners have granted them a franchise over County roads. O.

RICHLAND, WASH.—Articles of incorporation have been filed here for the Richland Telephone Company with a capital stock of $5,000 by E. E. Floyd, J. R. Gardner, William Read and others.

EUREKA, MONT.—Directors of the Eureka Mutual Telephone Company have decided to construct an extension of their lines up Sinclair Creek to Gateway. It is understood the work will be commenced early in the spring. O.

RED BLUFF, CAL.—The Tehama Telephone Company has been reorganized with James McCampbell as general manager, and considerable extension work is planned in the near future. All operating and line work is to be under the supervision of P. T. McGovern and W. G. Holt.

BRAINERD, MINN. — The Clear Water & Nokay Lake Telephone Company has been organized by farmers, and the line is to be limited to ten phones. G. F. Edquist was elected president; Andrew Peterson, vice-president; Fred Hanson, secretary, and J. H. Dickinson, treasurer.

OMAHA, NEB.—Dundee and a portion of the Walnut Hill district are to be served by a new telephone exchange to be built in the spring by the Nebraska Telephone Company. The new exchange is to relieve business of the Harney Exchange and will cost $100,000. Address the secretary for further information.

ELECTRIC RAILWAYS.

(Special Correspondence.)

KEYPORT, N. J.—The Jersey Central Traction Company is considering the extension of its main line to the Keansburg beaches, by way of upper Keansburg. A.

SPARTANSBURG, S. C.—In its report to the Legislature the State Hospital Commission recommended that a trolley line be built from Columbia to State Park, eight miles north of the city.

KENDALLVILLE, IND.—The Kendallville & Ft. Wayne Electric Railway Company will expend $30,000 for building steel bridges. The road will be extended. Address W. L. Taylor, Indianapolis, president.

NORTH YAKIMA, WASH.—Surveys have been completed by the Yakima Valley Transportation Company for extension of its branch line into the Wide Hollow District of the Tieton project, and assurance has been given to the ranchers along the line that the line will be built in the immediate future. O.

SEATTLE, WASH.—The rehabilitation of the Highland Park & Lake Burien Street Railway Company, recently accepted by the city as an unencumbered gift, will cost $43,000. Certain extensions at a cost of over $2,000,000 are being considered by the City Utilities Committee, of which Oliver T. Erickson is chairman. O.

MIAMI, ARIZ.—Plans are advancing for the construction of the proposed interurban line between Globe and lower Miami, which is being promoted by W. D. Fisk, of Globe, and associates. The Corporation Commission of Arizona is expected to approve the issuance of $100,000 of bonds proposed by the company. D.

CLARKSTON, WASH.—The committee appointed to secure in Clarkston a $10,000 subscription for stock in the F. L. Sturm Electric Railway Company, which purposes building a line from this city to Lewiston, Idaho, recently announced that the sum had been collected. This means that the line will be constructed immediately. O.

MILWAUKEE, ORE.—An interurban railway from this city to Logan, 18 miles in length, a branch of the Portland & Oregan City Railway, is projected. The Milwaukee Commercial Club is agitating the movement, and other commercial bodies along the line have become interested. The line, if started, will be extended as far as Wilhoit Springs. O.

WAYCROSS, GA.—Directors of the street railway are considering the question of extensions that are needed in several parts of the city. The Board is favorable to completing the line to Gilchrist Park and it is believed work on this part of the improvement schedule will start at an early date. Hebardville is another point to which the street railway will build.

SHREVEPORT, LA.—The Louisiana-Texas Traction Company, represented here by Major A. B. Blevins and Glen N. Walker is considering the project of constructing an interurban electric line from Mansfield, northwardly to Vivian, passing the city of Shreveport and the towns of Blenchard, Oil City and Mooringsport. A committee of Vivian business men and officials, including Mayor Baker, has been named to work on the franchise and rights-of-way details. Eventually the line will be extended to Longview, Tex.

NEW INCORPORATIONS.

BAY CITY, MICH.—Michigan Light Company has been incorporated with a capital stock of $3,000,000 by William H. Barthold, Carl Wilcox and James A. Brown.

PITTSBURGH, PA.—The Braddock Electric Machine Company, of Pittsburgh, will be incorporated by W. J. Nowotny, Anne Nowotny and P. D. Remington. S.

INDIANAPOLIS, IND.—The Hercules Electric Company has been incorporated with a capital stock of $25,000 by Katherine Blake Kurtz, S. H. Kurtz and others.

ELDORADO, WIS.—Wisconsin Light, Power & Milling Company has been incorporated with a capital stock of $10,000 by O. A. Huelsman, A. H. Genrich and L. F. Lurvey.

WATERTOWN, MINN. — The Crescent Electric Company has been incorporated with a capital stock of $50,000 by Guy E. Halgren, James J. Ponsford and others.

TRENTON, N. J.—The Mercer Gas & Electric Fixture Company has filed articles of incorporation with a capitalization of $25,000. The incorporators are Raymond H. Rue, Harris O. Bruner and Chester L. Snedeker.

BAYONNE, N. J.—The Eleco Company has been incorporated with a capital stock of $2,000 to deal in electric supplies. The incorporators are Norman Johnson, Mildred V. Staufer and Joseph Bardate, of New York City.

MANHATTAN, N. Y. — Gotham Electrical Supply Company has been incorporated with a capital stock of $5,000. The directors are Wilfred G. Johnston, George H. Johnston and Helen Johnston, of New York City.

MANHATTAN, N. Y. — Wagga Company has been incorporated with a capitalization of $50,000 to engage in the electrical supply business. The directors are Lyman E. Warren, Charles A. Burr and Oscar H. Cacciloa, of New York City.

CHICAGO, ILL.—Steel City Fittings Company has been incorporated with a capital stock of $2,400 for the purpose of manufacturing and dealing in electrical and mechanical devices. The incorporators are William R. Watson, Arthur N. Thomas and L. O. Holkes.

HAILEY, IDAHO. — The Hailey Electric Company has been incorprated with a capital stock of $45,000. The incorporators are Fred W. Gooding and Frank R. Gooding. This company will own what was formerly the Cramer light and power system.

NEW YORK, N. Y.—The Keith Light Company, Incorporated, has been granted articles of incorporation to deal in electric and gas fixtures, etc. The capital stock is $300,000 and the incorporators are Leigh K. Lydecker, Maywood; Samuel M. Richardson, Westerleigh; and William J. Canary, Brooklyn.

TORONTO, ONT.—The Interurban Company, Limited, a new Toronto company, with the names of the incorporators nominally given as clerks in a Toronto legal office usually associated with Mackenzie & Mann enterprises, has been Federally incorporated, with a capital stock of $5,000,000. The company is empowered to deal in all kinds of bonds and debentures, to develop water powers, establish power plants, etc.

PROPOSALS.

STREET-LIGHTING SYSTEM.—Bids will be received on February 24 for the construction of a street lighting system or "White Way" on Main Street, Luverne, Minn. Address S. C. Rea, city recorder.

ELECTRIC MOTOR.—Bids will be reveived on February 24 for furnishing and placing an electric motor for the East Side sewage pumping station at Columbus, O., addressed to the Director of Public Service, Samuel A. Kinnear.

LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until March 30 for the lighting fixtures for the post office at Urbana, Ill.; and until March 31 for the lighting fixtures for the post office at Cartersville, Ga.

CABLE.—Sealed proposals will be received at the office of the Chief Signal Officer, War Department, Washington, D. C., until February 24 for furnishing under Proposal 689 11 miles paper-insulated submarine armored cable, type 324. For further information address Charles S. Wallace, Captain, Signal Corps, U. S. Army.

WIRE, WIRE STRAND, ETC.—Sealed proposals for furnishing 787,000 pounds of galvanized wire, silicon bronze wire, wire strand, and staples and 30,000 wire rope clips will be received at the United States Engineer Office, Customhouse, Memphis, Tenn., until February 25. Information will be furnished on application to E. M. Markham, major, Engineers.

MOTOR - GENERATOR SETS.—Bids will be received on February 26 for furnishing and delivering two 200-kilowatt motor-generator sets to operate under 60-cycle three-phase 440-volt alternating current and deliver 220-volt direct current at the municipal Reduction Plant of the city of Chicago, at Thirty-ninth and Iron Streets and on the west arm of the south fork of the south branch of the Chicago River, according to plans and specifications on file in the office of the department of Public Works, Room 406 City Hall. Address George B. Young, Commissioner of Health, Chicago, Ill., for further information.

ELECTRICAL EQUIPMENT. — Sealed proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until March 3 for furnishing miscellaneous cable for use on cranes, as per Schedule 6,420, for delivery at the Navy Yard, Washington, D. C.: one 10-ton three-motor electric gantry crane, as per Schedule 6,401, for delivery at the Navy Yard, Brooklyn, N. Y.; 10 general-alarm gongs and contact makers, as per Schedule 6,429, for delivery at the Navy Yard, Charleston, S. C.; material for miscellaneous switchboard panels, as per Schedule 6,429, for delivery at the Navy Yard, Brooklyn, N. Y.; and one triple-plunger pump, electrically driven as per Schedule 6,399, for delivery at the Navy Yard Boston, Mass. The Bureau will also receive bids until March 10 for a large amount of cable, as per Schedules 6,419, 6,426 and 6,423, for delivery at the Navy Yards, Brooklyn and Philadelphia, and until March 17 for 10 electrically operated potato peelers, of one-horsepower capacity, as per Schedule 6,430, for delivery at the Navy Yard Brooklyn, N. Y.

NEW PUBLICATIONS.

HOLYOKE REPORT.—The annual report of the Gas and Electric Department of the city of Holyoke, Mass., for the year 1913, has been published in pamphlet form.

BUREAU OF LONGITUDE.—The Bureau des Longitudes, Paris, France, has prepared its Annuaire for the year 1914, containing the usual tables. It is published by Gauthier-Villars and the price is 30 cents.

TRANSFORMERS.—Technical Paper No. 211 of the Bureau of Standards is entitled "Accuracy of the Formulas for the Ratio, Regulation and Phase Angle of Transformers," by P. G. Agnew and F. B. Silsbee.

SPECIFICATIONS FOR INCANDESCENT LAMPS.—The Bureau of Standards, Washington, D. C., has issued the sixth edition of circular No. 13 entitled "Standard Specifications for Incandescent Electric Lamps."

GOVERNMENT OWNERSHIP.—The address by Charles P. Brush, vice-president of the Postal Telegraph-Cable Company, on "Government Ownership of Telegraph Lines" at Hartford, Conn., on January 20, has been published in pamphlet form.

COPPER-WIRE TABLES.—The Bureau of Standards, Washington, D. C., has issued a second edition of circular No. 31 entitled "Copper Wire Tables." The data on which the tables are based were adopted as international standards by the International Electrotechnical Commission at its meeting last September.

THE EFFECTS OF ICE ON STREAM FLOW.—The design, installation, and operation of any plant that depends for its success upon flowing water demands a knowledge of the total flow of the stream and its variation throughout the year. The United States Geological Survey has been compiling for years stream-flow records for many streams in the United States and the methods of collecting such records for open-water periods have been standardized, but during the winter the presence of ice affects the flow so much that the laws of flow pertaining to open channels are not entirely applicable, and no standard methods for collecting and interpreting the data at that season have been recognized. In many localities ice persists in the streams for periods ranging from a few days to several months, and although the conditions resulting from ice are most pronounced in northern regions they are prevalent over wide areas, especially at high altitudes.

Recent studies made by the Geological Survey have added much information in regard to the factors influencing stream flow when ice is present, and with a view to standardizing, so far as practicable, the methods for ascertaining winter flow Water-Supply Paper 337, entitled "The Effects of Ice on Stream Flow," by William Glenn Hoyt, has been published. This paper discusses the factors that influence the run-off during the periods of low temperature, the varieties of ice and their effect on the applicability of the laws of open-channel flow, and the collection and interpretation of necessary data. A copy of the report may be obtained free on application to the Director of the Geological Survey, Washington, D. C.

FINANCIAL NOTES

At the annual meeting of New York Edison Company Edward G. Love was elected a director to succeed the late A. N. Brady.

The Northern Ohio Traction & Light Company has filed notice of an increase in its capital stock from $13,000,000 to $15,000,000, the new stock to be all preferred.

H. R. Fehr, president of the Lehigh Valley Transit Company, announces that he has sold $1,000,000 refunding and improvement five-per-cent bonds of the Lehigh Valley Transit Company. Proceeds of this sale will be sufficient to retire the floating debt of the company and to provide funds for additions and betterments for the current year.

Dividends

American Railways Company; regular quarterly of 1.5 per cent on common, payable March 14 to stock of record February 28.

Atlantic Gas & Electric Company; the regular quarterly dividends of 1.5 per cent on its preferred stock, payable February 14.

Brockton & Plymouth Street Railway semi-annual of $3 on the preferred, payable March 16 to stock of record March 7.

General Electric Company; quarterly of two per cent, payable April 15 to stock of record February 28.

Manhattan Bridge Three Cent Line; initial quarterly of 1.5 per cent, payable March 2 to stock of record February 26.

Pennsylvania Water & Power Company; initial of one per cent, payable April 1 to stock of record March 16.

Plymouth Street Railway Company; semi-annual of $3 on preferred payable March 16 to stock of record March 7.

Tennessee Railway Light & Power Company; regular quarterly of 1.5 per cent on preferred, payable March 2 to stock of record February 14.

Reports and Earnings.

LOUISVILLE RAILWAY COMPANY.

	1913	1912
December gross	$275,321	$270,360
Net after taxes	127,078	122,261
Surplus after charges	56,911	56,261
Net from Interurbans	17,131	21,968
Net income	74,042	78,229
Twelve months gross	3,226,275	3,130,492
Net after taxes	1,377,757	1,340,455
Surplus after charges	539,924	561,122
Net from interurbans	196,814	234,805
Net income	736,738	796,007

MEXICAN TELEPHONE & TELEGRAPH.

(Mexican Currency.)

The Mexican Telephone & Telegraph Company reports for the nine months ended Nov. 30, 1913, compared as follows:

	1913	1912
Gross	$563,191	$528,797
Expenses	284,368	248,171
Net	278,822	280,625

FEDERAL TRACTION COMPANY.

The consolidated statement of the Federal Light & Traction Company and subsidiary companies (excluding the Deming Ice & Electric Company) for the fiscal year ended December 31, 1913, shows net earnings of $903,492, a decrease of $33,307. The income account compares as follows:

	1913	Decrease
Gross earnings	$2,329,164	*$161,657
Net earnings	903,492	33,307
Interest charges	531,821	*88,994
Cent. Ark. Ry. & Lt. pfd. div.	63,000	Unchanged
Fed. Lt. & Tr. div.	150,000	Unchanged
Bond discount	40,716	33,179
Surplus	117,955	89,122

*Increase.

OREGON ELECTRIC RAILWAY.

	1913	1912
December gross	$ 95,882	$ 91,574
Net after taxes	24,857	21,106
Twelve months' gross	1,215,383	953,847
Net after taxes	366,487	284,947

SOUTHERN NEW ENGLAND TELEPHONE.

The report of the Southern New England Telephone Company for the year ended December 31, 1913, compares as follows:

	1913	1912
Gross	$3,594,560	$3,317,216
Expenses	2,828,208	2,609,912
Net	766,352	707,306
Dividends	706,740	593,514
Surplus	58,612	113,792

AMERICAN LIGHT & TRACTION.

The American Light & Traction Company reports for the twelve months ended December 31, 1913, compares as follows:

	1913	1912
Gross earnings	$4,466,233	$4,256,860
Expenses	123,107	117,657
Net earnings	*4,343,126	4,139,203
Surplus and resources previous year	8,689,292	7,835,726
Total surplus	13,032,419	11,974,929
Cash division on preferred stock	854,172	854,172
Cash division on common stock	1,341,182	1,215,732
Stock division on common stock	1,341,182	1,215,732
Total division	3,536,537	3,285,637
P. & L. surplus	9,495,882	8,689,292

*After deducting preferred dividends of $854,172, the balance, $3,488,954, is equal to 25.08 per cent earned on $13,911,000 common stock, as compared with 26.05 per cent earned on $12,610,200 stock previous year.

TWIN CITY LINE.

The report of the Twin City Rapid Transit Company for the year ended December 31, 1913, shows net earnings of $4,369,695, against $4,010,966 the preceding year. The balance after preferred dividends was equal to 12.9 per cent on the common stock, as compared with 11.3 per cent earned the year previous. The income account compares as follows:

	1913	1912
Gross	$8,870,336	$8,208,968
Expenses	4,500,641	4,198,001
Net	4,369,695	4,010,966
Interest and taxes	1,561,440	1,529,231
Surplus	2,808,255	2,481,736
Dividends	1,416,000	1,416,000
Surplus	1,392,255	1,065,736
Depreciation and ren	1,060,000	775,000
Surplus	332,254	290,735

NEW ORLEANS RAILWAY & LIGHT.

The report of the New Orleans Railway & Light Company for the twelve months ended December 31, 1913, compares as follows:

	1913	1912
Gross	$6,924,426	$6,628,147
Net after taxes	2,592,848	2,652,264
Surplus after charges	*872,579	995,033

*Equal to 5 per cent on $10,000,000 preferred stock and an additional 1.86 per cent on $20,000,000 common stock. This compares with 2.47 per cent earned on common stock previous year.

DETROIT UNITED.

The report of the Detroit United Railway Company for the year ended December 31, 1913, compares as follows:

	1913	1912
Gross	$12,723,838	$11,695,530
Operating expenses	8,694,231	7,730,409
Net	4,029,607	3,965,121
Surplus after charges	780,477	825,464

COMMONWEALTH POWER, RAILWAY & LIGHT.

Commonwealth Power, Railway & Light, for year ended December 31, 1913, reports income as follows:

	1913	1912
Earnings on stocks owned in subsid's	$2,083,019	$1,197,970
Miscellaneous earnings	320,670	104,490
Total gross earnings	2,403,689	1,302,461
Expenses and taxes	92,583	78,587
Interest charges	397,680	54,823
Net income	1,913,425	1,169,050
Preferred dividend	760,000	360,000
Balance for common stock	1,153,425	809,050
	1913	1912
December gross	$346,530	$153,123
Net after expenses, taxes and interest	286,156	142,211
Balance after preferred division	206,156	112,211

WISCONSIN GAS & ELECTRIC.

The Wisconsin Gas & Electric Company reports for year ended Dec. 31, 1913:

	1913	1912
Gross earnings	$ 753,410	$ 680,793
Net earnings	205,622	201,266
Gross income	211,156	205,665
Surplus after charges	104,315	99.692
Balance after preferred dividends	92,315	89,942
On common stock	9.23%	8.99%

WISCONSIN EDISON.

The Wisconsin Edison Company, Inc., reports consolidated net earnings of its subsidiaries for the twelve months ended November 30, 1913, of $2,626,710, an increase of $66,340. The income statement for November and the fiscal year compares as follows:

November—	1913	Increase.
Operating revenue	$ 722,742	$ 55,459
Net after taxes	228,332	15,305
Twelve Months—		
Operating revenue	8,301,190	622,462
Net after taxes	2,626,710	66,340
*Surplus after dividends	1,134,668	60,353

*Applicable to securities of Wisconsin Edison Company, Inc.

CHICAGO TELEPHONE COMPANY.

The report of the Chicago Telephone Company, for the year ended December 31, 1913, compares as follows:

	1913	1912
Gross	$16,274,602	$14,538,399
Ex., repairs & maintenance	13,638,048	12,003,986
Net revenue	*2,636,554	2,534,413
Dividends	2,161,000	2,160,000
Surplus	475,554	374,413

*Equal to 9.76 per cent on $27,000,000 capital stock, as compared with 9.38 per cent earned on same stock the previous year. The profit and loss surplus as of December 31, 1913, was $662,763.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Feb. 16.	Feb. 9.
American Tel. & Tel. (New York)	120	121
Commonwealth Edison (Chicago)	135⅞	136
Edison Electric Illuminating (Boston)	255	255
Electric Storage Battery, common (Philadelphia)	55	54
Electric Storage Battery, preferred (Philadelphia)	55	54
General Electric (New York)	148	146
Kings County Electric (New York)	120	120
Manhattan Transit (New York)	1	1⅛
Massachusetts Electric, common (Boston)	11	10½
Massachusetts Electric, preferred stamped (Boston)	62	62
National Carbon, common (Chicago)	150	155
National Carbon, preferred (Chicago)	118	111
New England Telephone (Boston)	140	140½
Philadelphia Electric (Philadelphia)	26⅞	26⅝
Postal Telegraph and Cables, common (New York)	84¾	81
Postal Telegraph and Cables, preferred (New York)	69	69
Western Union (New York)	64⅛	63
Westinghouse, common (New York)	70	70
Westinghouse, preferred (New York)	115	116

PERSONAL MENTION.

MR. LOUIS STEINBERGER, inventor of "Electrose," is the subject of some interesting commentary in an article entitled "Better Business," by William Hand, in the current issue of "Everybody's Magazine." This article dwells particularly upon Patent-Office conditions.

MR. JOHN F. WALLACE has resigned as president of the Electric Properties Corporation to devote all of his time to the management of Westinghouse, Church, Kerr & Company, the stock of which is owned by the first-named corporation. Mr. Wallace is succeeded by MR. A. LUDLOW KRAMER, who has given up the vice-presidency of the Equitable Trust Company.

MR. JOHN W. FOSTER, manager of sales of the Chicago office of the Holophane Works of the General Electric Company, announces that this office has been transferred from 425 South Wabash Avenue to room 715 Mallers Building. The territory covered by this office has been increased to include North and South Dakota, Minnesota and Wisconsin. MR. R. E. PERRY, who has handled Holophane sales in the Cleveland district has been transferred to the Chicago district with headquarters at Minneapolis.

MR. HENRY A. MORSS, vice-president of the Simplex Wire & Cable Company, Boston, Mass., delivered an address before the contract department employees of the Commonwealth Edison Company, at the rooms of the Western Society of Engineers on Tuesday evening, February 17. He described the various processes of insulating rubber-covered, taped, braided and steel-taped wires and cables and discussed the preparation of rubber and rubber compounds, and the use of formula for determining resistance and voltage characteristics of the conductor. The lecture was illustrated with many lantern slides of typical machinery and scenes in the Simplex plant.

PROF. VLADIMIR KARAPETOFF, of the electrical department of Cornell University, has returned from a trip to Washington, D. C., where he delivered four two-hour lectures before the engineer officers of the United States Army, Washington Barracks. The lectures were given on February 5, 6 and 7, and the subjects treated were "Alternating Currents," "Theory of Electrical Machinery," "Design of Electrical Machinery," and "The Fundamentals of the Magnetic Circuit." Lieutenant Atkisson, who is in charge of electrical and mechanical engineering, and his assistant, Lieutenant Lampert, are former students of Professor Karapetoff at Cornell.

MR. CHARLES R. UNDERHILL, electrical engineer of the Acme Wire Company, New Haven, Conn., gave an experimental lecture on "Electromagnets" before the Yale University Branch of the American Institute of Electrical Engineers on the evening of February 11. At the request of Prof. Charles F. Scott, Mr. Underhill repeated the lecture before the senior class on the afternoon of February 12. The subject related chiefly to the effects of magnetic leakage in plunger electromagnets, and Mr. Underhill showed how the ordinary laws of traction, as usually given in textbooks, had to be modified on account of leakage, so that the traction may be accurately predetermined. Experiments were performed with special apparatus to prove each statement.

MR. HARRY C. SLEMIN, sales and advertising manager of the Stromberg-Carlson Telephone Manufacturing Company, of Rochester, N. Y., is leaving the electrical business to become connected with the Yawman & Erbe Manufacturing Company, of Rochester. He will assume the position of advertising manager. Mr. Slemin began telephone work in the Western Electric Company's Chicago plant in 1896. In 1904 he went to Rochester with the new Stromberg-Carlson organization to take charge of the apparatus engineering department. Later he was given full charge of the lead-covered cable business, and in 1910 was appointed advertising manager. In 1911 he was made sales and advertising manager, combining both departments.

MR. J. G. BARRETT has been appointed district manager of the St. Louis office of the Holophane Works of the General Electric Company. This office will be located in the Frisco Building

J. G. Barrett.

and will direct the sales in the states of Iowa, Nebraska, Missouri, Kansas, Oklahoma, Texas, Louisiana and Arkansas. A complete display room has been equipped and a full line of Holophane products will be on exhibition. Mr. Barrett will be assisted by MR. R. H. LYON.

MR. E. H. WADDINGTON has been appointed district manager of the Cooper-Hewitt Electric Company, at St. Louis, Mo., with offices at 1408 Central National Bank Building. Mr. Waddington is well known throughout the electrical industry. He was for some time connected with the Western Electric Company in the capacity of illuminating engineer. Later, and until quite recently, he was employed by the General Electric Company in the same capacity. With both organizations he was in charge of the sale of illuminating goods, acting also in an advisory position in connection with their different branches. With this expert knowledge of the subject of illumination and his wide acquaintance, Mr. Waddington will prove a valuable factor in the development of the company's business in the territory he will cover, which will include five states adjacent to Missouri.

OBITUARY.

DR. KARL PICHELMAYER, professor in the Technical Institute at Vienna, Austria, and member of the International Electrotechnical Commission, died suddenly on January 23, in the forty-sixth year of his age.

FOREIGN TRADE OPPORTUNITIES.

(Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., and at the branch offices of the Bureau, 315 Customhouse, New York, N. Y., 629 Federal Building, Chicago, Ill., and Association of Commerce Building, New Orleans, La. Apply for addresses in letter form, giving file number.)

NO. 12,491. BARBERS' ELECTRICAL SUPPLIES.—One of the largest importers of barbers' supplies in a European city informs an American consulate that he would like to get in touch with American manufacturers of electrically operated barbers' equipment of all kinds, such as hair brushes, face massage, and shampooing machines. Correspondence with the inquirer should be in Italian or French.

NO. 12,500. PUSH-BUTTON DOOR BELLS.—An American consul in Great Britain reports that a local firm desires quotations on push-button door bells, delivered in gross lots, c. i. f. port of entry. There is direct steamship service with New York.

DATES AHEAD.

American Institute of Electrical Engineers. Annual mid-winter convention, Engineering Societies Building, New York, N. Y., February 25-27. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

Central Electrical Railway Association. Cleveland, O., February 26-27. Secretary, A. Neereamer, 308 Traction Terminal Building, Indianapolis, Ind.

American Physical Society. Columbia University, New York, N. Y., February 28. Secretary, A. D. Cole, Ohio State University, Columbus, O.

State Independent Telephone Association. Des Moines, Iowa, March 10-12. Secretary, Charles C. Deering, 309 Life Building, Des Moines, Iowa.

Telegraphers' Mutual Benefit Association. New York, N. Y., March 11. Secretary, M. J. O'Leary, 195 Broadway, New York, N. Y.

Buffalo Electric Show. Elmwood Music Hall, Buffalo, N. Y., March 9-14. Secretary, Harry S. Hilliker, Electric Building, Buffalo, N. Y.

American Railway Engineering Association. Annual convention, Chicago, Ill., March 17-20. Secretary, E. H. Pritch, 900 South Michigan Avenue, Chicago, Ill.

Society of Efficiency, New York, N. Y., April 4-11. Secretary, W. H. Tallis, 41 Park Row, New York City.

American Electrochemical Society. Twenty-fifth general meeting, New York N. Y., April 16-18. Secretary, Joseph W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Street and Interurban Railway Association. Cedar Rapids, Iowa, April 23-25. Secretary, H. E. Weeks, Davenport, Iowa.

Cleveland Electrical Exposition, May 20-30. Manager, William G. Rose, Wigmore Coliseum, Cleveland, O.

Association of Railway Telegraph Superintendents. Annual meeting, New Orleans, La., May 19-22. Secretary P. W. Drew, 112 West Adams Street, Chicago.

Southwestern Electrical and Gas Association. Annual meeting, Galveston, Tex., May 20-23. Secretary, H. S. Cooper, Dallas, Tex.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel Philadelphia, Pa., June 1-5. General Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

Wagner Electric Manufacturing Company, St. Louis, Mo., has opened a branch at Memphis, Tenn., where local and southwestern trade will be looked after. H. W. Briscoe, who has been at the general offices, has been put in charge of the branch.

M. B. Austin & Company, 700 West Jackson Boulevard, Chicago, Ill., in the February issue of the *Austin Post*, describes and illustrates some interesting applications of "Safety Rubicore" insulated wire and "Safety" steel-taped cable.

Oshkosh Manufacturing Company, Oshkosh, Wis., has prepared a new booklet describing the Oshkosh guy anchor. The leading jobbers all over the country are distributing this booklet and also a folder in colors descriptive of the new guy anchor. Detailed information can be secured from the Oshkosh Manufacturing Company or the nearest jobber.

W. N. Matthews & Brother, St. Louis, Mo., are sending out a number of circulars calling attention to the installation of Matthews guy anchors. The simplicity of these anchors is pointed out and a section is shown to make clear the great holding power that they possess. A number of photographs are reproduced showing lines that were improperly guyed and heavy damage resulting thereto from storms.

The Stevenson Company, Pittsburgh, Pa., has issued a booklet on Stevenson molded insulation. This material is made from a number of different mixtures to make it applicable to a wide range of uses. It provides high dielectric property, lightness, high finish, mechanical strength, heat resistance, imperviousness to moisture, oils and chemicals, etc. A large number of molded insulating parts are shown.

Carbolineum Wood Preserving Company, 518 Prairie Street, Milwaukee, Wis., manufacturer of "Avenarius" carbolineum wood preservative, is distributing a very interesting series of letters devoted to information respecting the preservation of lumber. The company has available some highly valuable information respecting the preservation of poles, ties and posts, indicating the methods of application and the cost of the wood preservative. This series of letters will be sent to those interested upon request.

The Esterline Company, 227 East South Street, Indianapolis, Ind., has issued descriptive folder No. 312, which is devoted to the use of Esterline graphic meters, both of the switchboard and portable type. These instruments are used for recording a variety of values and are the means of increasing the efficiency of a plant quite materially. The record is easy to read and the instrument is so arranged that all its parts are readily accessible. The company has also issued a number of loose leaves for its graphic-meter data book and price list.

Central Electric Company, 320 South Fifth Avenue, Chicago, Ill., has published an elaborate circular describing and illustrating a special group of designs showing the Central "Alberyl" semi-white glass for illumination designs of various characters. This special group is just enough for a window display and a complimentary price is made for the purpose of introducing the group. The circular describes 13 shapes and 20 pieces, and the list prices itemize up more than double the special net price which is offered for introduction.

Schweitzer & Conrad, 1770 Wilson avenue, Chicago, Ill., have issued bulletin No. 2, which describes the Schweitzer high-voltage detector. This is a simple and compact device for quickly detecting high voltage and for "phasing out." This firm has also issued bulletin No. 3, devoted to the Schweitzer recording synchroscope. This instrument makes a permanent record of the operation of switch closing when paralleling and thus gives an operator a tangible means of studying his work in order to improve it; the instrument also locates errors in synchronizing and places blame for them.

The Safety Insulated Wire & Cable Company, New York, has been awarded a contract for over $28,000 worth of insulated wire and cable for the construction and installation of a thoroughly modern underground fire-alarm and police-signal system for the city of Cleveland, O. H. A. Bowen, superintendent of Fire-Alarm Telegraph, prepared the estimate, resulting in the securing of the appropriation. Alfred A. Beuesch, director of Public Safety, and Hiram F. Stillman, secretary of the Board of Public Safety, were instrumental in pushing the project to a successful issue. The order for "Safety" wires and cables was secured through M. B. Austin & Company, manager of the Safety Company's western department.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., his issued a number of new publications, of which folder No. 4237, is entitled "The Way to Charge Three Cells;" it describes the mechanical vibrating rectifier for charging small storage batteries for ignition and lighting sets on automobiles; all that is necessary to operate it is to connect the two wires from the binding posts to the battery and turn the switch. "Small Motors No. 18" covers the application of small alternating-current and direct-current motors; a detailed illustrated description is given of the construction of these motors; the application of these motors to various devices, such as washing machines, vacuum cleaners, piano players, pumps, sign flashers, and ironing machines, is discussed. "Westinghouse Electric Vehicle Equipment" is the title of section No. 3,223 of catalog No. 3,002-A; it shows a number of illustrations and gives detailed description of the construction of the electric motor and its application; curves are given of the performance of 60 and 80-volt motors and a convenient equipment for charging electric vehicle batteries is described. "Electric Household Helps" is the title of a little folder illustrating the use of electrical devices in the household; the reading matter describes the cooking of breakfast, dinner, supper and lunches, and also treats of the uses of these devices in the boudoir, sewing room and other rooms about the house; a complete price list is given, showing the watts consumed by each device. Catalog section No. DS1410 covers direct-current switchboard panels for 110 and 220-volt systems; a detailed description is given of the various apparatus and sketches are shown of the arrangement furnished on standard panels. Section No. DS842 of the trolley-line material catalog lists and describes various bracket arms for direct and catenary construction. Catalog section No. DS843 covers catenary line material; it describes and illustrates with considerable detail the different types of insulators, hangers, strain ears, etc., together with diagrams showing the spacing for wheel trolleys and pantograph trolleys.

Record of Electrical Patents.

Issued by the United States Patent Office, February 10, 1914.

1,086,346. Combined Pole and Lamp-Post. C. Barrick, assignor to Union Metal Mfg. Co., Canton, O. Ornamental column for street lighting.

1,086,347. Caplet. R. B. Benjamin, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. An insulating cap with diverging openings is arranged to be held to the end of a conduit by a flange ring with lugs connected to a nut.

1,086,350. Receptacle and Conductor for Electric Lighting. J. S. Crossley, assignor to Pass & Seymour, Inc., Solvay, N. Y. Receptacles for mounting

at intervals on a pair of flexible conductors.

1,086,368. Surfacing and Polishing Machine. F. P. Huyck, assignor to C. E. Haynes, Toledo, O. Motor-driven floor-sandpapering machine.

1,086,396. Electric Locomotive. G. F. Perin, assignor to Jeffrey Mfg. Co., Columbus, O. A mining locomotive with separate motor for driving a reel to take up slack cable.

1,086,414 and 1,086,415. Electric Zinc-Furnace with Integral Condenser. J. Thomson, New York, N. Y. Has a carbon bed resistor and overhead galleries through which the charge is spread to zones on the upper face of the resistor.

1,086,416. Electric Zinc-Furnace with Integral Compound Resistors and Compound Condensers. J. Thomson. Has a rod resistor and a carbon bed resistor, between which resistors the charge is placed.

1,086,417. Electric Zinc-Furnace with Integral Condenser. J. Thomson. The space between the resistors is subdivided longitudinally by slabs of insulating material.

1,086,418. Universal Electric Zinc-Furnace with Integral Condenser. J. Thomson. Has sumps below the resistors.

1,086,426. Lighting Fixture. F. W. Wakefield, assignor to the F. W. Wakefield Brass Co., Vermilion, O. A combined lamp receptacle and shade-holder.

1,086,428. Manufacture of Electric Filaments. C. A. von Welsbach, assignor to Welsbach Light Co., Gloucester City, N. J. A filament of osmium or similar metal of the platinum group.

1,086,431. Controlling Device. P. H. Zimmer, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. A solenoid-operated motor starter.

1,086,437. Dry-Cell Battery. W. Broad, Beaver Falls, Pa. A refillable dry cell with adjustable compression device.

1,086,444. Electromagnetic Shuttle-Operating Mechanism. E. L. De Long, Plant City, Fla. For a loom.

1,086,486. Self-Regulating Dynamo-Electric Machine. C. A. Vandervell and A. H. Midgley, Acton Vale, England. Has unwound supplementary poles between the regular poles and short-circuited brushes on either side of the supplementary poles.

1,086,489. Treating Steel in Electric Furnaces with Basic Hearths. W. R. Walker, New York, N. Y. Consists in adding a slag containing about 30% silicon and 70% lime and maintaining the metal and slag molten in the furnace.

1,086,494. Metallurgical Furnace. U. Wedge, Ardmore, Pa. Electric heaters are inserted into plugs in the flue.

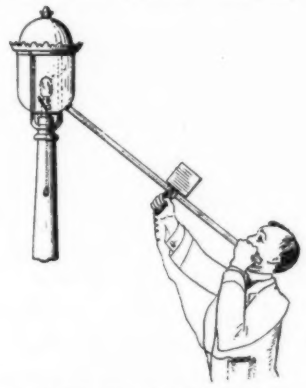
1,086,507. Electric Switch. B. L. Bronson, Blairsville, Pa., assignor of one-half to J. S. Baughman. The mechanism includes a ratchet.

1,086,527. Street-Indicator for Cars. R. Hamilton and C. C. Timmons, Amarillo, Tex. The separate circuits of a series are closed successively by individual switches.

1,086,530. Transmitting of Vocal and Other Sounds. F. P. Herrguth, San Francisco, Cal., assignor to Universal Wireless Telephone & Telegraph Co. The transmitting system includes a Wheatstone bridge having a number of inductances, microphones shunted around these, and a step-up transformer having its primary connected with the coils.

1,086,534. Artificial Lighting. H. E. Ives, assignor to United Gas Improvement Co., Philadelphia, Pa. A semi-indirect reflector for a wall lamp of such a shape as to prevent the direct light from the lamp from striking the adjacent walls, though it may pass to the ceiling and floor.

1,086,535. Photometer. H. E. Ives, assignor to United Gas Improvement Co. Includes an electric standard lamp and portable battery therefor, the



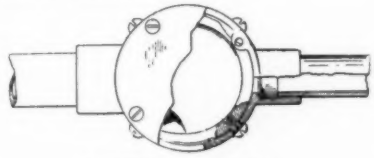
1,086,535.—Portable Photometer.

handle of the movable box having a switch and clutch. (See cut.)

1,086,537. Musical Accenting Device. J. F. Kelly, Pittsfield, Mass. For an electrically operated automatic piano-player.

1,086,543. Electric Lamp Socket. W. G. Lindemann, Milwaukee, Wis. Special means for locking the cap and shell.

1,086,546 to 1,086,548. Operating Mechanism for Washing and Like Machines. G. N. Meves, Davenport, Iowa. These three patents cover various gear arrangements for motor-driven washers.



1,086,630.—Conduit Box.

1,086,559. Folding, Portable Electric-Light-Bath Cabinet. C. F. Reuter, Oakland, Cal. A special arrangement of the walls to permit folding, the inner walls carrying lamps and connections therefor.

1,086,562. Trolley Mount. E. Rose, Mamaroneck, N. Y. The yoke is carried on a horizontal pivoted extension to the top of the pole.

1,086,565. Sparking Device for Gas Engines and the Like. J. E. Seeley, assignor to High Frequency Ignition Coil Co., Los Angeles, Cal. Includes an induction coil, a condenser and resonators.

1,086,578. Electric Switch. T. E. Barnum, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Release by an electromagnet permits a drum-type switch to open.

1,086,579. Electrolytic Washing and Bleaching Device. E. Bess, Hamilton, O.; A. Bess, administrator of said E. Bess, deceased. Within a cylindrical tank is a perforated reversing agitating cylinder and beneath it an electrolytic cell.

1,086,581. Annunciator or Station-Indicator for Cars. W. G. Billerman, Cleveland, O. Motor-operated and electromagnetically controlled.

1,086,587 and 1,086,588. Connecting Device. F. H. Chapman and O. E. Kinney, assignors to Yost Electric Mfg. Co., Toledo, O. An attachment plug within which is a plunger governing a quick connection with the screw shell of a lamp socket.

1,086,599. Electric-Switch Device. C. J. Klein, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. A push-button snap switch in a candle cup under a candelabra lamp.

1,086,600. Electric Signal for Automobiles. L. E. Landes, Los Angeles, Cal. Has a series of special push-buttons.

1,086,613. Trolley. J. Pfeiffer, P. Olah, and A. G. Falkenstein, Salt Lake City, Utah. A telescopic pole with guard arms on each side of the wheel.

1,086,622. Knife Switch. C. Schuster, Bellevue, Pa., assignor of one-half to C. N. Bergmann. A laminated blade with spacing strips between the leaves, both passing through the marble or slate slab.

1,086,623. Conductor Post. C. Schuster, assignor of one-half to C. N. Bergmann. A mounting frame surrounds and is riveted through the laminated bars and spacing strips.

1,086,630. Distributing Box for Electric Conduits. C. E. Van Duzer, assignor to Adapti Mfg. Co., Cleveland, O. Has interchangeable segmental wall sections with interconnected edges. (See cut.)

1,086,639. Switch Construction. H. A. Benedict, Syracuse, N. Y. A rotary snap switch with resistance coil mounted in its base.

1,086,640. Earth Anchor. Jasper Blackburn, Kirkwood, Mo. Consists of a flat disk base with central sleeve for the anchor rod and a series of concentric annular ribs of decreasing height as the edge is approached.

1,086,643. Electric Light Socket. W. Breidenbach, Indianapolis, Ind. Has a rotatable threaded shell that may be locked.

1,086,646. Heating Apparatus for Water-Bottles. H. W. Christian, Longbeach, Cal. A flexible electric heater may be inserted into the water bag.

1,086,647. Measuring Machine. J. E. Cochran, Elkhart, Ind. Motor-driven.

1,086,661. Electric Switch. G. W. Goodridge, assignor to Bryant Electric Co., Bridgeport, Conn. For a lamp socket.

1,086,664. Apparatus for Making Cable-Grips. H. A. Havens, Syracuse, N. Y. Tapering studs for holding the wire strands of the grip as the braiding work progresses project into a tube through radial openings, and a tapering plunger within the tube gradually moves them out.

1,086,666. Storage-Battery Electrode and Process of Making Same. H. C. Hubbell, Newark, N. J. Alternate layers of iron and cadmium are assembled into a plate and the cadmium is then distilled out.

1,086,682. Automatic Circuit-Closer for Motor-Vehicle Starters. H. A. Menzel, Santa Clara, Cal. The electric starting motor for an automobile

fire engine has its circuit automatically closed by the fire alarm and opened when the engine starts.

1,086,693. Electric Fuse or Cutout. M. Walpole, Providence, R. I. A cartridge fuse with a main and an auxiliary fuse wire and heat-intensifying coils in the latter connected to an indicating fusee.

1,086,695. Printing-Telegraph System. A. H. Adams and A. F. Dixon, assignors to Western Electric Co. Has a number of branch circuits with interconnected relays.

1,086,706. Normal - Danger - Signal System. L. A. Hawkins and E. F. Bliss, assignors to Union Switch & Signal Co. A relay-controlled block-signal system.

1,086,710. Electric Hand-Lamp and Casing. E. A. Hoopes, Des Moines, Iowa. A vented storage battery carries on top a wide reflector and lamp.

1,086,717. Device for Lighting and Extinguishing Lamps. O. Jeidel, deceased, by B. Jeidel, widow of said O. Jeidel, Berlin, Germany. Includes an electromagnetic gas valve.

1,086,718. Master Vibrator. F. B. Johnson, Kansas City, Mo., assignor of one-half to G. Steinhorst. Has a number of induction coils each with an individual vibrator mechanism, a master vibrator and a switch for disconnecting the individual vibrators and introducing the master vibrator.

1,086,726. Resistance Unit. J. B. Opsahl, Madison, Wis. Comprises inner and outer metallic tube terminals and an interposed nonmetallic resistance powder.

1,086,729. Electrical Control Apparatus. J. A. Rey, Paris, France. A remote resistance-control system for a motor.

1,086,752. Block-Signal System. J. Burke, Erie, Pa., assignor to General Railway Signal Co. The signals are controlled by a current of different frequency from that of the propulsion current of the railway.

1,086,759. Apparatus for Producing Vacuum in Electric Lamps. L. A. Fell, Warren, O. Relates to the tube and valve construction.

1,086,765 and 1,086,766. Process for Improving the Magnetic Qualities of Iron-Silicon-Manganese-Aluminum Alloys. R. A. Hadfield, Sheffield, England. Consists, according the first patent, in heating to about 900° C. and then cooling and, according the second patent, in heating to above 900° C., cooling, reheating to below 850° C., and cooling slowly.

1,086,773. Engine-Starter. C. E. Kells, Jr., New Orleans, La. An electric starting motor partly controlled by the transmission-gear lever.

1,086,775. Electric Railway-Crossing Gate. A. S. Kobling, assignor of one-third to S. Toth, one-sixth to T. Bodak, and one-sixth to A. Krajnyak, Wallingford, Conn. Motor-operated.

1,086,787. Hood for Electric Lamps. H. Rithner, assignor to Crescent Glass Co., Wellsburg, W. Va. A glass hood held by fingers on a sheet-metal collar that encircles the neck of the bulb. (See cut.)

1,086,797. Electrically Driven Drill. W. F. Trotter, assignor to Jeffrey Mfg. Co. A motor-driven coal or rock drill.

1,086,798. Mail-Delivery Apparatus. O. H. Voldsness, Eleva, Wis. A motor-driven suspended carriage with self-contained battery and automatic control.

1,086,804. Electrolytic Cell for Generating Hydrogen and Oxygen Gases. J. B. Burdett, assignor to Burdett Mfg. Co., Chicago, Ill. Has a number of cathode and anode compartments and a continuous diaphragm mounted so as to form the separating walls for the compartments.

1,086,818. Dynamo-Electric Machine. A. M. Gray, assignor to Allis-Chalmers Mfg. Co. Special ventilating passages in the end frames prevent the circulation of heated air about the machine.

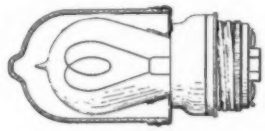
1,086,820. Connector. W. P. Hammond, New York, N. Y. Has a pair of flat cord terminals adapted to engage a binding post.

1,086,832. Portable Telephone Set. R. H. Manson, assignor to Dean Electric Co., Elyria, O. Includes a transmitter and receiver of watch-case form held at opposite ends of a hollow handle.

1,086,836. Target-Practice Apparatus. F. Mitchell, assignor to Atlantic National Bank, Providence, R. I. Includes an electric recording and alarm equipment.

1,086,850. Sparking Plug for Explosive Engines. H. D. Pomije, Olivia, Minn. Has adjustable sparking points.

1,086,864. Retaining Envelop or Cover for Storage-Battery Electrodes. E. W. Smith, Philadelphia, Pa. An insulating tube with longitudinal projecting ribs and elongated small pores.



1,086,787.—Lamp Hood.

1,086,869. Telephone Switching Apparatus. G. Swope, assignor to Western Electric Co. A wall plate with telephone line terminals and a signaling push button.

1,086,870. Cooking Appliance. A. L. Sykes, Covington, Ky. An electric "fireless" cooker with disk stove imbedded below the upper surface of the base, which is filled with heat-insulating material; a heat-insulating hood fits over the tapering sides of the base.

1,086,874. Lighting Fixture. F. W. Wakefield, assignor to F. W. Wakefield Brass Co., Vermilion, O. A special flattened link-chain suspension for an electric fixture.

1,086,879. Ice-Clearing Trolley. C. G. Woods, St. Louis, Mo. In front of the main trolley wheel is a sleet-scraping wheel with sharp transverse ribs.

1,086,899. Selecting Apparatus. O. A. Danielson, assignor to Western Electric Co. Includes two polarized relays and six secondary circuits.

1,086,909. Refillable Fuse Tube. G. Fisher, Cleveland, O. Has an insulated bar inserted in the casing and metallic springs secured to the bar having their ends overhanging the ends of the bar so as to hold the fuse wire.

1,086,932. Alarm-Clock Attachment. R. P. Packard, Tacoma, Wash. An electric alarm and lamp.

1,086,942. Relay for Strengthening Weak Electric Currents. J. Schiessler, Baden, Austria-Hungary. Includes an electromagnetically oscillated member.

1,086,957. Railway-Traffic-Controlled Apparatus. R. P. Tuttle, assignor to Union Switch & Signal Co., Swissvale, Pa. Includes a trip and electric contact rail adjoining the track.

1,086,958. Power Hoist. A. C. Van De Velde, Chicago, Ill. An electric motor suspended from a trolley rail drives a chain hoist through gearing.

1,086,960. Tablet. W. K. Waterman, New York, N. Y. Electrically illuminated flat wall sign.

1,086,985. Electrical Switch. W. L. Bliss, assignor to United States Light & Heating Co., New York, N. Y. A solenoid plunger switch.

1,086,999. Make-and-Break Device. P. J. Devault, Denver, Colo. Electromagnetically controlled cam and ratchet mechanism.

1,087,044. Electric Display Apparatus. P. Naylor, London, England. Includes electric lamps and resistance control therefor.

1,087,061. Tabulating Machine. H. Hollerith, Washington, D. C. Electrically operated.

1,087,068. Block-Cleaning Machine. F. O. Lueck, Tomah, Wis. Motor-driven.

Patents Expired.

The following United States electrical patents expired February 16, 1914:

577,037. Electrical Switch. C. D. Jenney, Indianapolis, Ind.

577,071. Electric Railway Motor. A. Schmid, Pittsburgh, Pa.

577,077. Electrical Warp Stop-Motion for Looms. A. C. Shuttleworth, Philadelphia, Pa.

577,081. Electric Controller. E. A. Sperry, Cleveland, O.

577,101. Telephone System. W. W. Dean, St., Louis, Mo.

577,102. Party-Line Telephone System. W. W. Dean.

577,119. Electric Brake. E. A. Sperry.

577,128. Signal. P. G. Feuerstein, Milwaukee, Wis.

577,130. Space-Block for Armatures. H. Geisenhoner, Schenectady, N. Y.

577,141. Means for Preventing Destructive Field-Magnet Discharges. F. Mackintosh, Schenectady, N. Y.

577,148. Binding Band for Armatures. H. G. Reist, Schenectady, N. Y.

577,158. Electric Igniter for Explosive Engines. W. F. Davis, Waterloo, Iowa.

577,159. Incandescent Electric Lamp. C. S. Dolley, R. Hawkins and T. M. Lightfoot, Philadelphia, Pa.

577,186. Progress of Electrodepositing Aluminum. C. G. Collin, Woodsburg, N. Y.

577,214. Resonant Electric Circuit. J. S. Stone, Boston, Mass.

577,231. Telephony. W. L. Bradshaw, Cincinnati, O.

577,233. Electrical Attachment for Barbers' Chairs. N. H. Burger, Benzonia, Mich.

577,242. Railroad Switch. J. F. E. Feltner, Leadville, Colo.

577,279. Electric Gas-Lighter. J. T. Armstrong and A. Orling, London, England.

577,307. Fire-Extinguishing Apparatus. H. F. Maxim, Norfolk, Va.

577,317. Electric Furnace. F. J. Patten, New York, N. Y.

577,329. Electrical Casting of Metals. N. Slawianoff, St. Petersburg, Russia.

577,370. Electric Furnace. F. J. Patten, New York, N. Y.

577,371. Electromagnetic Arc-Controlling Device. F. J. Patten, New York, N. Y.